



FRIDAY, FEBRUARY 22, 1895.

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Contributions.

The Union Pacific.

NEW YORK, Feb. 13, 1895.

TO THE EDITOR OF THE RAILROAD GAZETTE:

The trouble with the Union Pacific is simple and twofold. First, it is the original sin of construction, through which it was capitalized fictitiously to an enormous extent; and secondly, it is the complete and utter collapse of the silver mining interest which was its great staff and stay during its most prosperous years.

So far as I am competent to judge, the present trend of events is the best that could possibly occur. The first mortgage will be foreclosed, and the Government interest sold out. This is as it should be. The Union Pacific was the best investment the United States Government ever made. Had it been built wholly by the Government, and given to private parties, it would have been even a better investment than it now is; for it enabled the Government to put an end to those Indian wars, the expense of which was, to both the Government and the country, many times the whole cost of the Union Pacific. In the mere work of carrying the mails, and supplying its military posts and moving its troops with economy and despatch, the Government got out of the Union Pacific Railroad many times what it put into it. For the Government, therefore, I have no kind of sympathy. Its whole action toward the company was, in my opinion, one long story of breach of faith, arrogant imposition, and disregard of its obligations.

So far as the Union Pacific system, so called, is concerned, the first step to its reorganization is to get the Government out of the way; to have the mother company reorganized on a hard-cash basis; and then to consolidate with it the various branch lines on equitable conditions hereafter to be agreed upon.

PLATTE.

Explosion of a Car Heater.

NEW YORK, Feb. 15, 1895.

TO THE EDITOR OF THE RAILROAD GAZETTE:

The recent explosion of an alleged Baker car heater in a New York Central pay car, having been pretty generally noticed in the New York papers, I deem it important enough to warrant a word of explanation on this subject, as it will doubtless interest every railroad company, as all have the Baker heater either themselves, or with connecting lines.

I personally enquired at the New York Central station as to the particulars of this accident, but was informed that nothing was known further than the fact of the explosion, as the man sleeping in the car was the only one who could tell the particulars, and he was too ill to be interviewed.

The writer, however, knowing his own children well, can with certainty say that, although the heater may have been intended for a genuine Baker heater, the very fact of its exploding is proof positive that it was not in every sense a Baker heater; for if it had been, explosion would have been impossible.

The heater was in one or the other of the following named conditions, which conditions are utterly foreign to a Baker heater—especially a modern Baker car heater. The liquid within it, intended for circulation, was either frozen, or too low out of the circulating drum (the portion and the only portion of the heater that could explode to cause damage).

If the water is too low, an excessive and often a bursting pressure will be created; but with the frangible safety vent belonging to all modern Baker heaters, the vent would surely have burst instead of the drum, which in this, and every similar instance, is the only portion of the heater that can possibly explode to do damage—this from the fact that it is the only part that has an extent of surface sufficiently large for the accumulation of any dangerous pressure.

Without the circulating liquid being brine, to prevent its freezing, and a safety vent on the drum, whose disk is thin and frangible enough to break and relieve any pressure within the heater that is at all of a dangerous accumulation, the heater is not a Baker heater.

Without the circulating water being saturated with salt, the heater is not a "Baker."

A genuine, modern Baker car heater—not a part of a heater—has never been known among the 30,000 now in use to have ever burst, or in any other way to have injured any person, or itself. These facts are well attested by every railroader in the country—or the world—who is at all conversant with the Baker car heater, and its proper management.

WILLIAM C. BAKER.

Wages on the Southern Railway.

President Spencer and Vice-President Baldwin, of the Southern Railway, have promulgated a schedule of wages for the locomotive enginemen and firemen, and for the conductors and brakemen, on that road, in accordance with the agreement made with a committee of employees last December, and in connection therewith they have issued a pamphlet of a dozen pages giving statistics showing why the company is unable at present to make any material advance in the rates. The circular is addressed to the classes of employees named and to the committee. It opens with a statement of the reductions that were made on the Richmond & Danville and the East Tennessee, Virginia & Georgia, in the fall of 1893 and in February, 1894. These varied from 5 per cent. on the pay of men receiving low wages up to 15 and 20 per cent. on those receiving over \$300 a month. In the fall of 1894, after the consolidation of these companies into the Southern, the general officers and some others suffered a further reduction of from 10 per cent. to 25 per cent. It appears that before the consolidation the men on the East Tennessee received, in most cases, considerably less than those on the Richmond & Danville, and the new schedule provides for some increases to equalize this inequality; but, aside from this, no advance is granted, and the following facts are given to support the company's position.

First a statement of gross earnings, expenses and net earnings for four years, which shows decreases from 1891 to 1894 of 17 per cent. in gross earnings and 34 per cent. in net earnings. For the last half of 1894 there was a small increase as compared with 1893 (which was very bad), but a decrease from 1892. Then is given a statement showing the decrease per mile on all the railroads of the Southern States, from which it appears that both in gross and net the earnings of the Southern Railway were somewhat less than the average for the whole of that territory. Comparisons are also made with 1893, from which it appears that—

Using the average figures for all lines in the South Atlantic and Gulf States, it is seen that throughout the whole of that section of the South served by the lines of the Southern Railway Company, the gross earnings per mile of road—the necessary basis of the prosperity of a railway and of its power to pay wages—show the slight increase of only about three per cent. in 1893 as compared with 1883, while the net earnings per mile of road show a decrease of more than 22 per cent. These 10 years have marked the greatest industrial development in the history of the South, which development culminated in 1890, and was largely aided by, if not chiefly due to, the activity and growth of the railways. During this period the railways in that section have greatly improved their facilities for safe, prompt and economical transportation, much to the convenience and benefit of the public, and to the advantage of employees upon trains. This has been done, not only without returns, but with absolute loss to the owners, while the railway companies have been compelled to assume heavier responsibilities, and have been held more strictly accountable in their obligations to the public. The cost of all this has been very great; the employees have received the chief benefit, and yet they have not been called upon to share the loss until recently, and then only to a disproportionately small extent.

The average freight earnings per ton per mile, on all roads in the south, have fallen from 8.44 mills in 1890 to 7.06 in 1894, as shown by the statistics of the Interstate Commerce Commission. The reduction on the lines now composing the Southern Railway from 1888 to 1894 has been 24 per cent. or from 1.28 cents to 0.97 cents. The reduction in passenger rates has been, on all roads, in four years, 4 per cent. in the Virginias and the Carolinas and 6 per cent. in the other states traversed; while on the Southern Railway alone the reduction in six years has been 12 per cent. "These reductions in rates have been brought about largely by forces, some commercial and some legislative, over which the railways have no control, though they are partly due to the efforts of the railway companies to secure and foster new industries, and in times of depression to keep existing ones alive. The lower rates have been accompanied by a large decrease in gross earnings, and in earnings per mile, as already shown, and have, therefore, not been compensated for by increased volume of traffic. It ought to be generally understood that much of the reduction in railway earnings has been caused directly or indirectly by ill-advised legislation or by the action of State Railroad commissions, and that the effects of such reductions, if continued, must inevitably be felt by railway employees."

The statement then presents figures showing how the price of cotton has fallen from 10 cents a pound to 7 cents (at New York). The price of pig iron has fallen from \$14.20 per ton in 1887 to \$7.44 in 1894, a decline of over 47 per cent. in eight years. It is shown that the railroads have reduced freight rates on raw materials and taken other measures to mitigate the effects of these

and other losses on the prosperity of the South. The stockholders and bondholders of the Southern Railway have not only submitted to a shrinkage of \$40,000,000, or 30 per cent. in their securities, but have contributed \$12,000,000 in new money to rehabilitate the road, and they are not yet receiving any income upon this.

A table is presented showing that the railroads in other sections of the country enjoy a much larger traffic than do those in the South, with very much larger earnings per mile of road. A detailed list of averages is presented showing what the men will earn under the new rates if the number of days worked shall be the same as it was in the last four months of 1894, and it is stated, that the general average of these rates is in excess of the average rates now being paid. In some instances the old rates have been restored. This list shows:

	Days per mo.	Miles pr day.	Average Hours pr day.	\$ pr day.	\$ pr mo.
Passenger engineers	28.7	147	5½	4.04	116
Through frt. engineers	26.5	125	9½	4.53	120
Local freight engineers	26.4	92.5	10½	3.79	100
Passenger firemen	28.7	147	5½	2.62	58
Through frt. firemen	26.5	125	9½	2.26	60
Local freight firemen	26.4	92.5	10½	1.90	50
Passenger conductors	27.4	195	7¼	3.29	90
Through frt. conductors	24.1	125	9½	3.18	77
Local frt. conductors	25.4	94	10½	3.04	77
Passenger brakemen	27.4	195	7¼	1.53	42
Through frt. brakemen	24.1	125	9½	1.59	38
Local frt. brakemen	25.4	94	10½	1.52	39

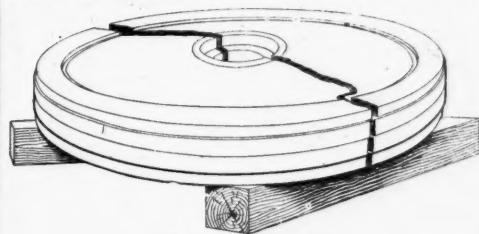
\* Main lines, \$100 a month; other lines, \$63 to \$90.

Finally the attention of the employees is called to the fact that they have the benefit of constant improvement in safety appliances and other things which make their work easier and safer, and the fact is reiterated that nothing has been exempt from the financial depression and shrinkage during the past few years; the purchasing power of the present wages is greater now than was that of the old wages under former conditions. Other employees have suffered reductions and the company, if it made an increase, would have to raise the pay of those men also. The reorganization has resulted in solvency, not wealth. The prosperity of the new company is still to be worked out. The new money put into the company must be used for better roadbed, equipment, signals and safety appliances. It is hoped that these will result in increased business.

The Accident to La Gascogne.

We gave last week a short account of the breaking of La Gascogne's piston and the delay which this and the heating of her crank pin bearings, together with the severity of the storm, caused. We present this week some further particulars of the accident, together with a sketch of the broken piston.

Regarding the cause of this break there seems to be very little known. The metal in the fracture shows no flaws, and no "hammering" was heard at the time of the accident to indicate that water was present in the cylinder. The piston-rod was not bent, and was found to be in good condition for use.



The Broken Piston.

The engines of La Gascogne were originally three independent, compound tandem engines, each with a high and low-pressure cylinder, of 42½ in. and 79.92 in. diameter respectively. On converting these into a single quadruple expansion engine all these cylinders were retained except the single high pressure, which was replaced by a new and stronger one of the same size, and the steam connections were so arranged that only one high-pressure cylinder was used, the other two being converted into first intermediate cylinders. Similarly, one of the three low-pressure cylinders was converted into a second intermediate. All three engines have a 66.93-in. stroke. The pressure in the high-pressure cylinder is normally 161.7 lbs., in the first intermediates 85 lbs., in the second intermediate 39 lbs., and in the low-pressure 10½ lbs. The broken piston was that of the second intermediate cylinder, in the middle tandem.

As soon as the accident was known steam was shut off and repairs begun. Both cylinders of the middle tandem were cut out—that is, one of the two first intermediates and the second intermediate. The connecting rod of the middle tandem was taken off, and a temporary steam connection made directly from the high-pressure cylinder to the remaining first intermediate, and from here to the two low-pressure cylinders. Four of the 12 boilers were disconnected, and in 16 hours steam was again turned into the engines.

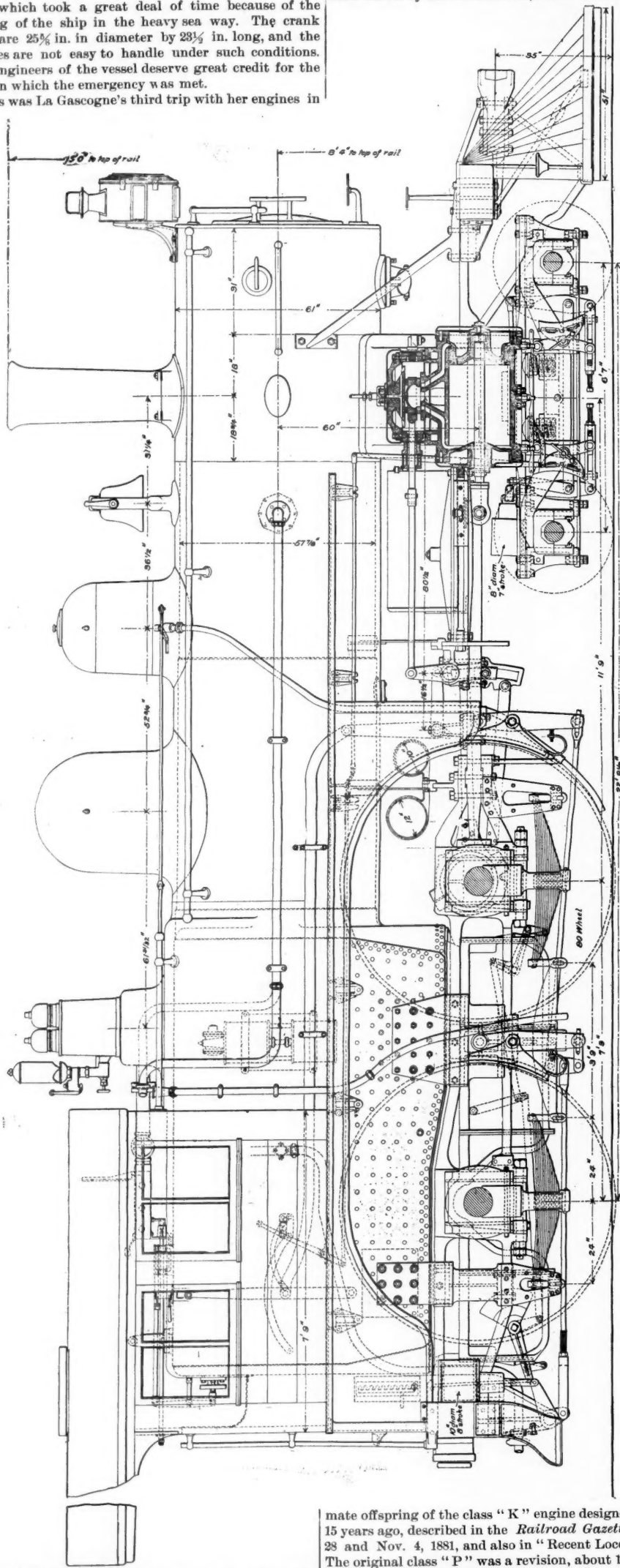
It is readily seen that the first intermediate steam space was now only half of that for which the engines were designed. This produced an excessive pressure in the first intermediate cylinder, thus causing the crank pin to heat and melt out the anti-friction white metal in the crank pin brasses, so that some of the metal ran into the oil grooves. This was cut out, and the crank

pin bolts of the connecting rod were slaked up a little, which caused a certain amount of pounding. It was then decided to replace the brasses with a spare set. These were fitted to the crank pin after a tedious operation, which took a great deal of time because of the rolling of the ship in the heavy sea way. The crank pins are 25 1/2 in. in diameter by 23 1/2 in. long, and the brasses are not easy to handle under such conditions. The engineers of the vessel deserve great credit for the way in which the emergency was met.

This was La Gascogne's third trip with her engines in

The Class "P" Locomotive and the Pennsylvania Railroad.

The class "P" locomotive of the Pennsylvania Railroad shown by the illustrations, is the direct and legiti-



THE REVISED CLASS "P" LOCOMOTIVE (80-INCH DRIVERS) OF THE PENNSYLVANIA RAILROAD.

of the dimensions and the weight have been increased, but otherwise the engine is much like the original. It is probably the best known of all American passenger engines, and has furnished the basis of design for much that is best in the design of the 8-wheel locomotives in this country with the firebox above the frames and with the Belpaire boiler.

The following table gives the dimensions as they are now and the changes since 1890, from the original design:

TABLE OF DIMENSIONS OF CLASS "P" LOCOMOTIVE.			
	Present Design.	Design of 1890.	Original Design.
Standard gage.....	4 ft. 8 1/2 in.	4 ft. 9 in.	4 ft. 9 in.
Fuel.....	Anthracite or bituminous		
Driving wheels, diameter.....	80 in.	68 in.	68 in.
Truck wheels, diameter.....	36 "	33 "	33 "
Tender wheels, diameter.....	33 "	33 "	33 "
Engine truck.....	Rigid center		
Journals, driving axles.....	3 1/4 x 10 1/4 in.	8 x 10 1/4 in.	8 x 10 1/4 in.
" truck.....	5 x 10 in.		5 x 9 in.
" tender.....	4 x 8 in.		3 1/2 x 7 in.
Wheel base, driving.....	7 ft. 9 in.		
" truck.....	6 " 7 "		
" total engine.....	22 ft. 9 1/2 in.	22 ft. 8 1/2 in.	22 ft. 8 1/2 in.
Wheel base, total tender.....	16 ft. 1 in.	15 ft. 6 in.	15 ft. 6 in.
Wheel base, total engine and tender.....	49 ft. 3 1/4 in.	48 ft. 7 1/4 in.	47 ft. 10 in.
Center of truck pin to center of leading driver.....	11 ft. 9 in.	11 ft. 8 in.	11 ft. 8 in.
Weight in working order on drivers.....	87,350 lb.	73,350 lb.	67,800 lb.
Weight on truck wheels.....	39,750 "	33,150 "	32,800 "
Weight of engine, total.....	127,050 "	106,500 "	100,600 "
Weight of tender, total engine and tender, loaded.....	197,050 "	172,000 "	156,900 "
Weight of tender, empty.....	30,100 "	29,800 "	26,100 "
Weight of full coal capacity.....	15,000 "	9,900 "	12,000 "
Weight of full water capacity of tank.....	24,000 "		20,000 "
Cylinders, diameter.....	19 in.	18 1/2 in.	18 1/2 in.
Stroke.....	24 "		
Distance, center to center of cylinders.....	6 ft. 5 in.		
Piston rod, diameter.....	3 in.	3 in.	3 in.
Form of crosshead and guides.....	Three bar shifting link	Two bar guides	Two bar guides
Valve gear, type.....			
Ports, length.....	20 in.	17 1/4 in.	17 1/4 in.
" width, steam.....	1 1/4 in.	1 1/4 in.	1 1/4 in.
" exhaust.....	3 in.	2 1/2 in.	2 1/4 in.
Slide valves, lap, outside.....	1 1/4 in.	3/4 in.	3/4 in.
Maximum travel of valves.....	6 in.	5 in.	5 in.
Lead of valves.....	None.	1-16 in.	1/4 in.
Boiler, type.....	Belpaire straight top.	Belpaire, raised top.	Crown bar, wagon top.
Diameter of barrel inside.....	57 1/2 in.	54 1/2 in.	54 in.
Thickness of barrel plates.....	5/8 in.		3/4 in.
Thickness of smokebox tube plate.....	3/4 in.		1/2 in.
Height from rail to center line.....	8 ft. 4 in.	7 ft. 3 1/2 in.	7 ft. 2 1/4 in.
Length of smokebox, including extension front end.....	71 in.	69 in.	69 in.
Working steam pressure.....	175 lbs.	160 lbs.	140 lbs.
Firebox, type.....	Belpaire.		Crown bar.
" length inside water inside.....	9 ft. 11 1/4 in.		
" depth at front.....	3 ft. 4 in.		3 ft. 3 1/4 in.
" " back.....	5 ft. 4 1/2 in.		4 ft. 4 1/2 in.
Firebox, thickness of side plates.....	3/4 in.		3/4 in.
Firebox, thickness of back plate.....	5/8 in.	3/4 in.	3/4 in.
Firebox, thickness of crown sheet.....	3/4 in.		1/2 in.
Firebox, thickness of tube sheet.....	3/4 in.		1/2 in.
Firebox, grate area.....	33 1/4 sq. ft.		34.7 sq. ft.
Firebox, staybolts, diameter.....	3/4 in.		
Firebox, staybolts pitch.....	1 1/4 in. ap'r'x	1 1/4 in. ap'r'x	1 1/4 in. ap'r'x
Water space width, front, back and sides.....	4 in.		P't. & b'k, 4 in.; sides, 3 1/4 in.
Tubes, material.....	Wro't iron.		
" number.....	258	210	237
" pitch.....	2 1/2 in. ap'r'x	2 1/2 in. ap'r'x	2 1/2 in. ap'r'x
" diameter inside.....	1 1/2 in.	1 1/4 in.	1 1/4 in.
Tubes, diameter outside.....	1 7/8 in.	2 in.	2 in.
Tubes, lengthwise between tube sheets.....	11 ft. 4 in.		10 ft. 10 7/8 in.
Total fire area of tube openings.....	3.92 sq. ft.	3.5 sq. ft.	4 sq. ft.
Heating surface, ratio to grate area.....	47.6	41.5	41.0
Ratio of exterior tube area to firebox heating surface.....	9.7	9.0	8.3
Heating surface tubes, exterior.....	1,435 sq. ft.	1,244 sq. ft.	1,365 sq. ft.
Heating surface tubes, interior.....	1,244 sq. ft.	1,091 sq. ft.	1,196 sq. ft.
Heating surface firebox.....	148 sq. ft.	138 sq. ft.	164.39 sq. ft.
Heating surface total, with exterior tube area.....	1,583 sq. ft.	1,533 sq. ft.	1,699 sq. ft.
Heating surface total, with interior tube area.....	1,392 sq. ft.	1,382 sq. ft.	1,530 sq. ft.
Exhaust nozzle diameter.....	5 1/4 in.	2 3/4 x 3 1/4 in.	2 3/4 x 3 1/4 in.
Smokestack, smallest diameter.....	18 in.	18 in.	18 in.
Capacity of tank.....	3,000 gallons.	9,900 lbs.	2,400 gallons.
Capacity of coal space.....	15,000 lbs.		12,000 lbs.
Brake fittings.....	P.R.R. brake on front of drivers, American brake on engine truck.	Spre'd brake on drivers, no brake on engine truck.	Spre'd brake on drivers, no brake on engine truck.
Tractive force per lb. effective pressure on both pistons.....	108.3 lbs.	121 lbs.	121 lbs.
Total tractive force with effective pressure=8.10 boiler pressure.....	15,162 lbs.	15,510 lbs.	18,560 lbs.
Total adhesive tractive power at 1/4 of weight on drivers.....	21,825 lbs.	18,337 lbs.	16,950 lbs.

their present form. Quadruple expansion engines will be put in the St. Louis, now being built by the Cramp Co., but five cylinders are used instead of six. It is probable that the engines of La Gascogne are the only ones of their kind in use.

mate offspring of the class "K" engine designed at least 15 years ago, described in the *Railroad Gazette* of Oct. 28 and Nov. 4, 1881, and also in "Recent Locomotives." The original class "P" was a revision, about 1886, of the class "K," the chief changes being to increase the cylinders 1/2 in., reduce the wheels from 78 to 68 in. and increase the heating surface from 1,240 to 1,699 sq. ft. Up to this time it has not been found necessary to make any important changes in general construction. Some



Some of the interesting features to be found in the latest type of the class "P" are as follows:

The pistons are very light and of the dished type. The crosshead has a covered top and runs between three guide-bars, clearly shown in the illustration. This is a change from the alligator crosshead and two-bar guide, which has so long been used on the Pennsylvania road. The tubes, which are 11 ft. 4 in., are 1½ in. outside diameter and in this differ from the common diameter of 2 in. The engine trucks have brakes. The front of the engine, as well as the rear of the tender, has the Janney coupler. The boiler has a straight top in the place of the former rise over the firebox. The boiler is made of pressed steel plates. The drivers have been increased from 68 to 80 in. and the driving-axle journals from 8 × 10½ to 8½ × 10½ in. with a 9-in. wheel fit. The cylinders are 19 × 24 instead of 18½ × 24. The steam ports are 20 × 1¼ and the exhaust 20 × 3 in the place of 17¼ × 1¼ and 17¼ × 2½ in. The valve travel was formerly 5 in., it is now 6 in., and the outside lap is 1½ in. instead of ¾. The principal features of the locomotives are so clearly shown by the illustrations and by the list of dimensions that further description is probably unnecessary to give a clear understanding of the design.

Some further comment on this locomotive will be found in the editorial columns.

#### Railroad Men at Purdue University.

On the 13th a party of railroad men and engineers visited the Purdue University at La Fayette, Ind., for the combined purposes of holding meetings of three com-

this way an opportunity is afforded for a Master Mechanic to learn about the practical operation of the details of his engines in a way that is impossible on the road, owing to the inaccessibility of many of the parts when the engine is running on the track. Of course there are many things that cannot be learned about a locomotive except by practical trials on the road, but, on the other hand, there is much that can be learned from an examination during a shop test that will never be seen when running on the track.

Probably the feature of the testing plant which produced the most striking impression on the visitors is the practicability of it. It is found that a locomotive can be taken off the road with steam up and be run into the testing plant and examined and be sent out again on the same day. Of course, such an examination is not, from a technical standpoint, a very complete one, but it is much more comprehensive than a road test that extends over several days. Furthermore, the cost of the shop examination to gather the data, outside of fuel, would probably not exceed \$50, while a road test of equal value would cost several times as much. If a railroad company owns its own testing plant the cost of an examination, including the fuel and labor, would be about \$25, that is, to gather such data as railroad men generally find useful with respect to new engines.

At present a very interesting series of tests is in progress at Purdue. In brief it is as follows: To show the effect of a change of lead at various speeds. To show the effect of a change of speed with a constant cut-off and the effect of a change in cut-off with a constant speed. To show the effect of different steam pressures

ready for use every winter in the northern part of the company's territory.

Even in such deep snow as that which has been encountered in Northern New York during the past three weeks, the rotary is adapted for use in opening the road only in a few places; for, as is well known, it cannot compete with the ordinary push plow in the matter of speed and cheapness, except where the snow is so deep that the latter cannot be easily kept in motion by two or three locomotives. By running push plows over the road very frequently a track can be kept reasonably clear, even where the snow is pretty deep, except at the points most liable to drifts. The experience of 1888 showed, however, that a rotary was a good investment, even in the East, and we have no doubt that the Central people would be glad to keep a machine housed for five years for the possible good it might do in the sixth.

A valuable use of the rotary, however, has been in widening the cuts made by common plows, and in this service the machine has been used every winter for the past six years. The snow is thrown in front of the machine by hand shovellers and the machine then throws it off as far as may be desired. As is familiar to everyone acquainted with railroad operations in Northern climates, a chief annoyance from the presence of snow is the drifting that occurs at exposed places after the storm is over. After a fall of, say, two feet, the weather continuing cold, the superintendent of a single track railroad finds long stretches of his track lying practically in a cut only 10 feet wide and with sides from three feet high upwards; and then until the next thaw, or until the

snow gets considerably settled, he is constantly annoyed with small drifts on the track which are blown in by comparatively moderate winds. These drifts, though perhaps quite small, are difficult to clear off, because the common plow finds no place to deposit the snow. With a few such obstructions as this the train dispatcher finds it impossible to make any calculations for his passenger trains that he can depend upon, and freight trains must be lightly loaded to avoid stalling at critical points.

Ordinarily, the remedy for this difficulty is to widen the snow cuts by shoveling the snow upward and backward on each side, and in an earth cut it frequently becomes necessary to handle the snow twice in order to get it far enough back to make a pathway for the trains, say 20 ft. wide. By the use of the rotary this operation is greatly shortened and quickened, as the shovellers can throw the snow downward upon the track, thence to be cleared off by the machine. Superintendent Van Etten, of the Central, has a number of photographs showing this work in progress. The shovellers go into a cut where the snow at the sides is, say 6 ft. higher than the rails, and throw the snow directly upon the track. Then the rotary is run through and throws it to a distance of 50 ft. or more to either side—that is, to the side where it will be least likely to be blown back upon the track.

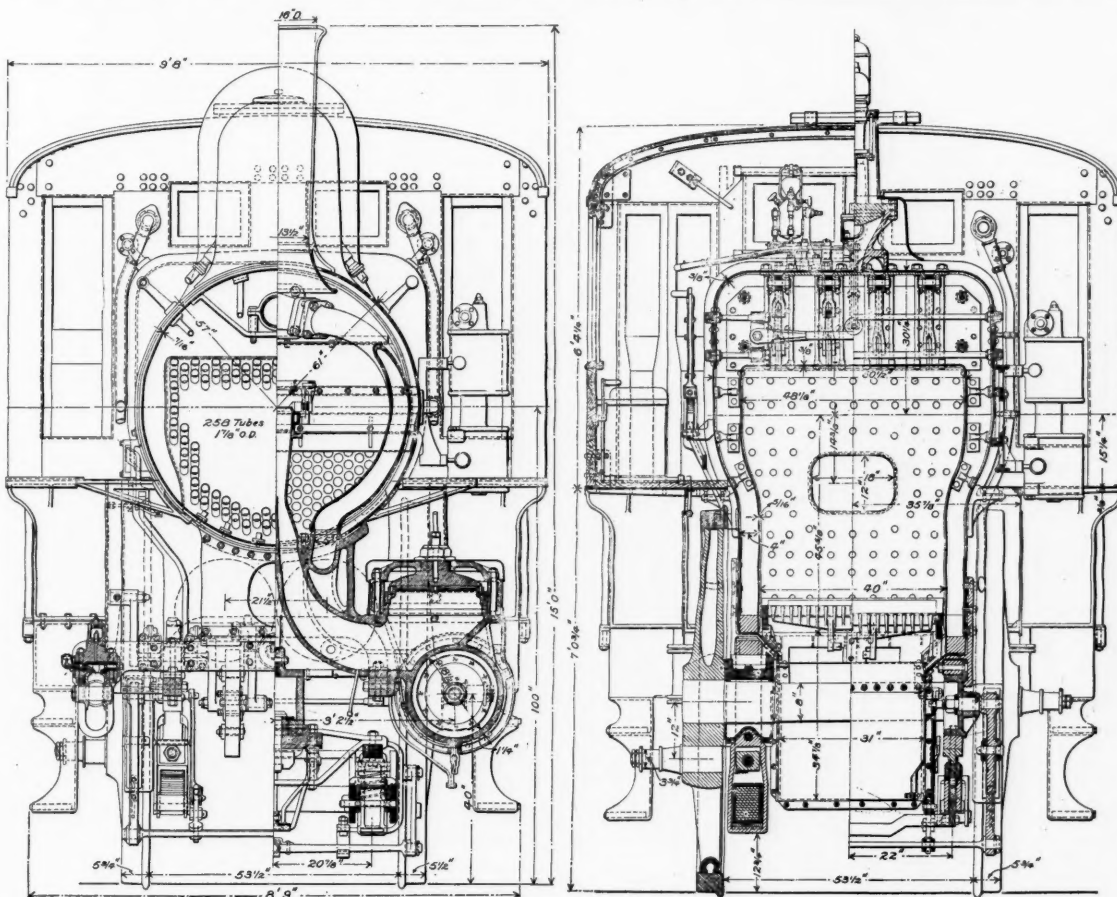
The machines have been in use in this kind of service for the last 10 days, and will continue at it for sometime longer. In the northern regions, where the snow that falls in December often "stays there" until March, the railroad superintendent must keep up the fight constantly; merely getting his road open is not enough. After trains have got to running with regularity, the forces must be kept at work, until the next storm, in throwing the surplus snow farther away from the track.

The New York, Ontario & Western has done good work this year with the Jull plow. At many points on this line the snow was over 20 ft. deep and the machine plow did excellent work. The line from Middletown to Liberty, 40 miles, was opened on the 10th, much earlier than would have been possible without the use of the machine.

#### A Report on a Balanced Locomotive.

BY MR. GEORGE S. MORISON.

The attention of the writer was first drawn to the subject of locomotive counter-balancing by a report of certain belt rails on an important western railroad, which was referred to him professionally. It was apparent to him then that this subject was being handled entirely from the locomotive side without reference to the effect on the track, and that this effect on the track was much more serious than was commonly supposed. As the matter was one which at that time had received comparatively little attention, and there was a decided feeling that what had been done for years was probably all right, he endeavored to get the matter agitated in the technical press. He found a warm ally in Mr. David L. Barnes, who took hold of the subject with such energy that the writer has done little himself. He is gratified now to see that a matter, which a few years ago was scarcely heard of, has become a leading topic of discussion in nearly all technical papers, while it is generally admitted that the present methods of counter-balancing are extremely defective.



Half Section through Guides. | Half Section through Cylinder. | Half Section through Back Wheel. | Half Section between Driving Wheels.  
Sections of Class "P" Locomotive.  
(All Sections Looking Backwards.)

mittees of the Master Mechanics' Association, and witnessing the operation of the locomotive test department. During the trip there were two meetings of the exhaust nozzle and smokestack committee, and one each of the conference committee and the locomotive test committee. Taken altogether, it was a very profitable trip, and considerable time was saved by having the members together, as some of the party are on two committees. Each committee has outlined its plans for further progress.

The exhaust nozzle committee will undertake two series of tests, one at Purdue University, and the other at the shops of the Chicago & Northwestern Railway. The conference and locomotive test committees will arrange a plan to forward the work at once. This committee has received much encouragement from the railroads, and the present discussion about the saving of fuel used for locomotives has added much to the general interest.

The new shop test department of the university is very nearly perfect so far as things are perfect in this practical life, and everything runs so smoothly that it is only a question of a few hours to gather the data for a very complete examination of any locomotive, no matter how large or of what capacity. This can be done at any reasonable speed and with but few assistants.

While the locomotive is running it can be examined on all sides to see the deflection of the parts and to estimate somewhat their probable durability and strength. In

with a full throttle and the effect of throttling. These tests are being carried on by the students.

The State of Indiana is now quite proud of its University, and an expression of public men recently showed that they feel that they now have a technical institution to which they can send the young men of the State with confidence that the course will give them a practical training that will fit them for mechanical pursuits.

#### The Rotary Snow Plow on the New York Central.

The recent severe snow storm has called the attention of Eastern people to the rotary snow plow more generally than before since 1888, and the use of it to clear the lines of the New York Central, and more particularly of the Rome, Watertown & Ogdensburg, which is controlled by the New York Central, has furnished interesting reading for a good many newspapers.

As every one knows, the rotary plow, and the others made on the same principle, constitute the only practicable means of clearing tracks of deep snow, except hand shoveling; and the New York Central ordered a rotary immediately after the great storm of March, 1888, when the lines of that company, in common with all others in New York and New England, were so completely blocked that little or nothing could be done with the ordinary push plows for two or three days. Since then the company has ordered another, and both are kept



About two years ago the writer's attention was called to a four-cylinder compound locomotive designed by Mr. George S. Strong, especially with a view to perfect balancing. In this locomotive, as first designed, various other features were incorporated; but the system of balancing was perfect and complete in itself, and could be applied to a locomotive conforming to the usual practice of any railroad, except only in the system of compounding. He believes that this is the only locomotive yet designed which offers a satisfactory solution of the counterbalancing problem.

The general problem may be briefly stated. Any mass of matter in motion tends to move at a uniform speed, except so far as retarded by external friction. The uniform rate of speed, however, is not that of any one portion of the moving mass, but of the center of gravity of the whole moving mass; if, therefore, the center of gravity changes as the mass moves, the motion of no one portion of the mass will be uniform, but will change as the center of gravity changes. In a locomotive, every time a moving part changes its place, the center of gravity moves also, and the speed at which each part of the locomotive moves varies. As the connection with the train is not made with the center of gravity, but with the frame of the engine, the engine does not pull the train at a uniform speed, but with a speed that varies with every motion of the moving parts of the engine. In order to overcome this difficulty, counterbalancing is used, the counterbalancing being added in the form of weights in the driving wheels opposite to the cranks, so that when the cranks move forward the weights will move backward, etc.; by this method all revolving parts can be balanced with practical perfection and the centre of gravity kept constant. The moving

tire weight on the driving-wheel and even to lift it from the track. This occurred on several railroads.

This occurrence was sufficiently alarming in itself, but a little thought showed that if at one part of a revolution the effect of counterbalancing was enough to lift the wheel from the track, at another portion of the revolution the pressure on the track must be at least double the estimated pressure, so that rails and bridges which were proportioned to carry a weight of 15,000 lbs. on a driving wheel were really subjected to a weight of 30,000 lbs. It is also evident that this maximum effect, in which the wheels jumped from the track, was simply the extreme case of a disturbance that was always occurring, and that the pressure on the driving wheels of any engine in which any portion of the reciprocating parts was counterbalanced by revolving weights in the wheels, was constantly varying.

As the centrifugal force of a revolving body varies with the square of the speed, it is evident that this disturbance is very much greater at high speeds than at low speeds and with small wheels than with large wheels.

At the annual meeting of the American Society of Mechanical Engineers, held in New York City last December, two very interesting papers upon this subject were read. The first was by Prof. W. F. M. Goss, of Purdue University, Lafayette, Ind., explaining certain tests which he had made with a locomotive which, instead of being suspended by chains, was so mounted that its drivers rested on revolving wheels, and by feeding pieces of soft wire between the driving wheels and the supporting wheels, while the engine was running at high speed, these wires showed, by the shape in which they came out, the variations of pressure. The other paper was by Mr. David L. Barnes, of Chicago, and contained an elaborate mathe-

cylinder locomotive in which the two cranks were placed opposite each other; such an engine, however, would be an impractical machine, as it would constantly be stuck on a centre; furthermore, the two cylinders would necessarily be so far apart that while the centre of gravity would be kept constant vertically and longitudinally, it would move transversely, producing the effect called nosing or wobbling from side to side.

The balanced compound locomotive meets this requirement by the use of four cylinders, two high pressure and two low pressure, the high pressure cylinders being placed between the frames and connecting on crank axles, while the low pressure cylinders are placed outside the frames and connect on crank pins. The crank pin on each side is placed directly opposite the axle crank on the same side, so that while the high pressure piston is moving forward the low pressure piston is moving backward, and the reciprocating parts of one balance the reciprocating parts of the other. On the other side of the engine the same arrangement exists, the cranks on one side being set on the quarter from those on the other, so that the four cranks are at right angles to each other.

The revolving parts of the low-pressure cylinders and the parallel rods are balanced in the usual way by revolving weights in the wheels. The revolving parts of the high-pressure cylinders are balanced by counterweights built in with the crank axles. The reciprocating parts of each high-pressure cylinder balance the reciprocating parts of the low-pressure cylinder on the same side of the engine. So far as either vertical or longitudinal disturbance is concerned, the counterbalancing is perfect. So far as transverse disturbances are concerned the disturbance is reduced to that due to the small distance between the centers of the high and low-pressure cylinders, and this is not enough to create any serious nosing. The four cylinders make a system of compounding at least as economical as any compound locomotive yet designed, while the fact that the two cylinders on one side begin their work at the same time simplifies the valve motion.

The only constructive detail which has been criticised is the crank axle, and when it is remembered that crank axles are the common European practice this objection will be seen to be more fanciful than real. Every marine engine really has a set of crank axles in the shaft.

In brief this locomotive, while giving all the advantages which can be claimed for a compound engine, is the only locomotive yet designed which is counterbalanced vertically as well as horizontally, and which, therefore, while exerting a uniform pull on the train, also exerts a uniform pressure on the track.

As the engine is perfectly balanced vertically there is no occasion for using the large driving wheels that become necessary at high speeds in the ordinary locomotive; there is no more pounding on the track with 400 revolutions per minute than with 200; a 4-ft. wheel will run as smoothly at high speeds as an 8-ft. wheel, and engines can be built which will have the small wheels, which are needed to make quick starts and yet which can be run with perfect safety at extreme speeds between stations, the constant requirement of local and suburban trains.

#### Tests of Bridge Steel.

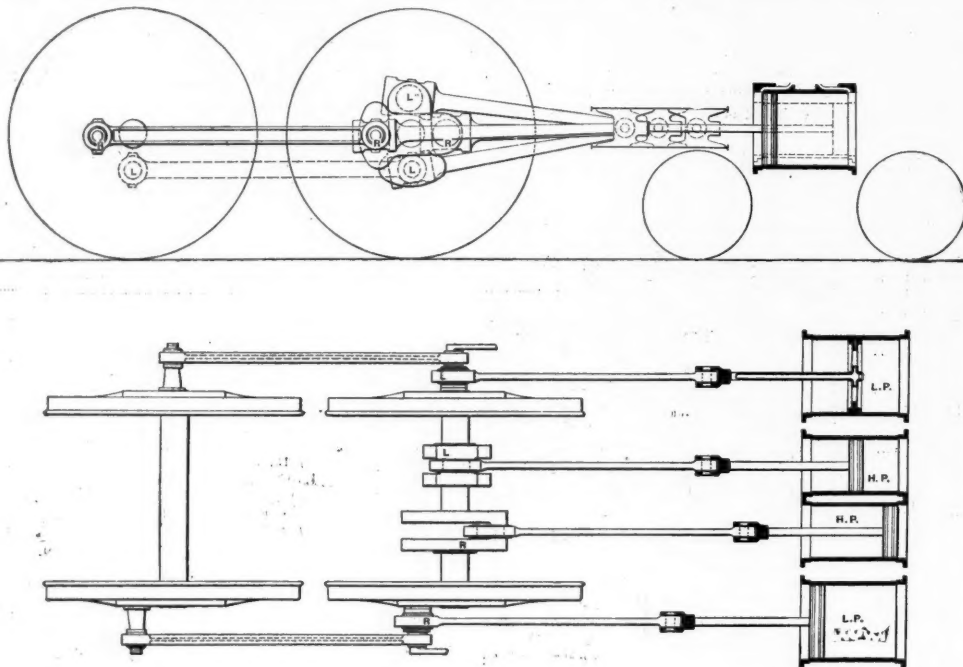
The table herewith is a condensed record of 71 tests on 600 tons of bridge steel rolled in January, 1895, at the Pennsylvania Steel Company's and Carbon Steel Company's mills, under the specifications of G. H. Thomson, Consulting Engineer, and inspected by A. C. Cunningham, of the American Engineering and Inspection Association, Albany, N. Y.:

	Ay.	Low't.	High't.	Range.	Specific limit.
Area, square inches.....	0.767	0.581	1.115	.834	
Carbon, per cent.....	0.138	0.115	0.190	.075	No limit.
Phos., ".....	0.079	0.052	0.089	.028	.08
Mn., ".....	0.340	0.023	0.180	.457	.45
Sul., ".....	0.440	0.015	0.390	.375	.04
Copper, ".....	0.041	0.001	0.160	.159	.20
Elas. limit, lbs.	40,561	37,120	43,480	6,360	Not less than 38 M.
Ult. str., lbs.	60,607	57,100	63,530	6,430	58 M. to 65 M.
Elong. in 8 in. per sq. in.	28.10%	25.00%	31.80%	6.80%	24% to 26%.
Reduction, per cent.....	55.70	44.00	62.40	18.40	50%.

Average elastic limit .....	40,561	= 66.81 per cent.
Average ultimate stress.....	60,607	
Highest elastic limit .....	43,480	= 76.07 per cent.
Corresponding ultimate stress .....	57,160	(Carbon Steel Co.)
Lowest elastic limit .....	37,120	= 63.02 per cent.
Corresponding ultimate stress .....	58,900	(Pa. Steel Co.)
Corresponding elastic limit. ...	40,630	= 63.99 per cent.
Highest ultimate stress. ....	63,530	(Pa. Steel Co.)
Corresponding elastic limit. ...	39,030	= 68.35 per cent.
Lowest ultimate stress.....	57,100	(Pa. Steel Co.)

Lowest elastic limit found, 61.1 per cent.

This report indicates that there is no difficulty in procuring steel with the elastic limit equal to two-thirds the ultimate strength, and that the difference between the specification limits for ultimate strength (of 7,000 lbs.) is within good practice.



Arrangement of Pistons, Rods and Cranks—Strong's Balanced Compound Locomotive.

parts, however, are not all revolving parts; the piston rods, crossheads and the forward half of the main rods have a reciprocal motion back and forth and not a rotary motion; in other words, they disturb the centre of gravity in a horizontal plane, but cause no vertical disturbance. If these reciprocating parts are balanced by revolving counterbalances those revolving counterbalances can overcome the horizontal movement of the centre of gravity, but will create a vertical disturbance of this centre of gravity precisely equal to the horizontal movement which they balance. As, however, the horizontal movement is the one which creates an irregular pull on the draw-bar and gives a jerky motion to the engine and train, this horizontal disturbance is balanced, though at the expense of a vertical disturbance.

The old approved practice of counterbalancing locomotives was to suspend the engine from an overhead frame and adjust the weights in the driving wheels until it remained stationary when run at a high speed. No attention was paid to the fact that this steadiness was obtained at the expense of varying strains in the suspending chains. This rough, experimental method has generally been superseded by the arbitrary practice of balancing a specified portion of the reciprocating parts, commonly two-thirds of the whole, and the actual defects of this practice were not observed so long as trains ran at comparatively slow speeds.

A few years ago, however, the attention of railroad men was called to the fact that rails at various places were destroyed by a series of short bends, the distance between these bends corresponding to the circumference of the driving wheels of a locomotive which had run over them. A further examination showed that the locomotive itself bore marks indicating that the driving wheels had lifted and struck the running board above. Mathematical calculations followed and showed that the vertical disturbance caused by the counterweights when revolving at high speeds was enough to overcome the en-

mathematical investigation of these disturbances; among his conclusions Mr. Barnes gives the following:

"The maximum rail pressure of a driving wheel is not at all indicated by the static load of the wheel on the rail. The impressed load due to the 'excess balance' is often double the static load, and the pressure at the point of impact when the wheel lifts from the rail and drops is even greater. There appears to be no way of determining what the impact pressure is, but the impressed load due to the 'excess balance' can be calculated by the formula for centrifugal force. About all that is known about the impact pressure is that it is enough at times to bend a 70-lb. rail downward vertically one inch in cases where the engine has small wheels, and is run too fast."

Various methods have been devised for overcoming this vertical disturbance and many engineers have come to the conclusion that the best thing that could be done was to reduce the weights of the reciprocating parts; this is admittedly only a reduction and not a cure. Meanwhile a new feature has been introduced into locomotives which, instead of reducing the trouble, increases it greatly, and that is compounding. In a two-cylinder compound locomotive the weight of the reciprocating parts of the low pressure cylinder is necessarily very much greater than that of the smaller piston of the simple locomotive, while in four-cylinder compounds (like the Baldwin) the weight of the reciprocating parts is increased enormously. The economies which are claimed for these compound locomotives are necessarily obtained at the price of increased vertical disturbances.

The only method by which a locomotive can be perfectly counterbalanced is one in which the centre of gravity is kept constant under all conditions, both vertically and horizontally. The revolving parts must be counterbalanced by revolving parts and the reciprocating parts by reciprocating parts. If an engine can be counterbalanced in this way it will run uniformly at all speeds, exerting a uniform pull on the train behind it and a uniform pressure on the wheels; this is the only possible perfect running locomotive.

The result would be partially accomplished by a two-



### The Van Buren Street Rocking Bascule Bridge.

In the last issue of the *Railroad Gazette* appeared drawings and a description of the new bridge at Van Buren street in Chicago. We now give an additional engraving showing a general view of the bridge and its surroundings. In the background is seen another bridge of the same type, belonging to the Metropolitan Elevated Railroad, over which its trains will enter the business center of the city. A cut and a short notice of this bridge were given in the *Railroad Gazette* of October 20, 1893. It was designed by the late William Scherzer, and built by the Lassig Bridge & Iron Works of Chicago. It is now near completion. The general design does not materially differ from the Van Buren street bridge, but it will be used solely for trains. The West Chicago Street Railway

one by Leon Casterman, Managing Director of the Government Rifle Factory at Herstal; the other by Felix Melotte, Engineer for the International Company of Electricity, which supplied the electric plant, has been made by the C. & C. Company, and should be in the hands of everyone interested in the subject.

Mr. Casterman states, among other advantages: The elimination of belts, cables, pulleys, counter-shafts, etc., diminishing enormously the chance of accident or interruption; the accurate figures obtainable as regards power transmitted and delivered: the smallest disproportion between effective work and the passive resistance of the transmitting device, and thus the highest average efficiency; minimum of masses in movement; advantage in case of future enlargement; the possibility of easily disconnecting each transmitting shaft, and of

satisfaction. It is obvious that the ultimate solution of the problem is a direct-coupled motor, although the first cost and the fear of an excessive amount of care-taking stand in the way of its adoption.

The question which the engineer will ask is, "Will electrical transmission enable me to turn out work at less cost?" In a factory where the motive power is not much more than one per cent of the wages, interest, etc., if the adoption of electrical transmission would increase the production of each man one per cent only, this would compensate for doubling the cost of motive power. On the other hand, if it would involve a loss of only one per cent in the efficiency of the workmen and machines, it is frivolous to insist upon the relative advantage of a difference between a transmission efficiency of ten or twenty per cent. since there is an absolute loss equal to the total cost for motive power.

#### DISCUSSION.

Professor CROCKER: Those who install electric transmission in their factories cannot obtain exact figures, but will have to be guided by the practice of other shops where the conditions are similar. The exact efficiency or the actual amount of work done will not determine this point. I claim that the question, whether it is satisfactory in the long run and whether the superintendents and workmen like it, will best determine the success of this system. Figures are important, but many factors which you cannot put your finger upon must be considered.

The greatest advantage is the fact that the shop is clear and the motive power is practically out of the way. I am sure that in very few, if any, shops are all the tools used any considerable fraction of the time. The average load year in and year out is about 30 per cent. of the total capacity. Figures have been made, showing from 25 to 28 per cent. These may possibly be low.

Mr. Richmond considers that the shop is running full most of the time. I believe that this is not so; in fact, where the running is light, the especial advantage of electric power is most apparent.

Mr. OBERLIN SMITH: It seems to me without question that we may call the matter of power at least equal. In my opinion it is greatly in favor of the electrical driving. Even now, in the present state of the art, it seems to me it will pay to run machines in that way as fast as they can be properly equipped. Later on we shall have great improvements. I do not believe in putting motors on existing lines of shafting and using all the old belts and counter shafts. I should put one motor on each machine. The space saved may be used for auxiliary traveling cranes. Another advantage of that space is the greater light afforded. Then there is the matter of safety and quietness, both of which will inevitably raise the morale of our workmen. The facility with which an electric motor can be stopped in case of emergency is a great advantage.

Mr. Smith mentioned a case of excessive load on a punch, which resulted in no more harm done than the melting of the little lead safety wire, showing how convenient this system is in cases of emergencies.

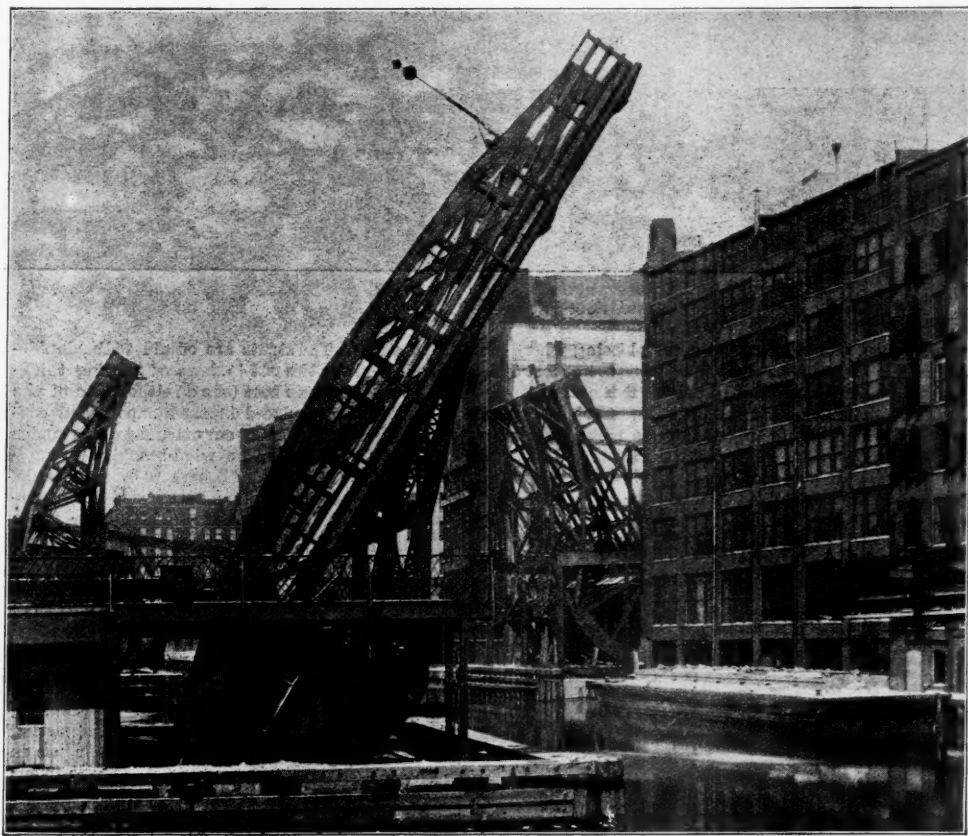
A motor, being simply a rotating member and a stationary member, should not cost much for repairs. I do not believe the cost of maintenance will be a serious bar to their use. Motors, if enough are wanted, might be made much cheaper. The cost of raw material is not great, and methods of manufacturing will be much simplified.

Mr. FAY: There are one or two questions which Mr. Smith has raised in my mind. One is, the question of first cost. The first cost of an electric installation is high when you direct connect a motor to a machine, low when you group. When the purchasers learn to buy motors quickly, prices will drop 40 or 50 per cent. One of the largest parts of general expense is the terrific cost of getting people to buy motors.

It is not always proper or profitable to put a motor on every engine. We are building motors that will run at the speed you require without gear or belt, but we do not believe the efficiency of a very small motor is high enough to pay for using it if we can possibly help it. A 3-H. P. motor will give us a commercial efficiency of 88 per cent. A ½-H. P. motor is a good one at 60 per cent. Taking 15 or 20 per cent. loss out of the belt transmission and putting it into a motor will not increase the dividends at all. Recognizing this, we propose to build a motor, say of 3-H. P. and 85 per cent. efficiency, running at 250 or 300 revolutions per minute, and we extend the motor shaft out and connect to it 1, 2, 3, 4 or 5 small drills or lathes. I have taken some measurements of that extension and I find that a 20 ft. armature shaft extension might add a loss of one-tenth of one horse power. From these facts we have concluded that direct connection is the proper thing with motors that will run slow enough to do away with gear, and that in most cases grouping is far more economical than individual motors on each machine.

Regarding the change of speed. Motors now will give us a difference in speed of 100 per cent. without any sparking, even when the field is weak. This has been done by field commutation. Thus speed can be changed without loss through gearing.

Mr. PLATT: I probably saw the first plant for electric transmission in existence, in a South Wales colliery, where electric pumps were driven by a 3-H. P. Schuckert motor brought over from Germany. In 1883 they put in a Siemens motor. Both worked satisfactorily under unfavorable conditions. Four years ago, in England, we drove capstan heads with compound wound motors from 60 or 80 revolutions down to 40 with gearing and



The Van Buren Street Rocking Bascule Bridge.

Company tried to prevent the Metropolitan Elevated from building this bridge, saying that the driving of piles would injure the walls of its tunnel, about 100 ft. distant, and an appeal was filed with the Secretary of War, but the attempt failed.

### The Electric Motor in the Machine Shop.

Mr. George Richmond read a paper before the American Society of Mechanical Engineers on Feb. 13, on "The Electric Motor in the Machine Shop," from which we abstract the following:

A very great advantage has been found in the substitution of electric motors for local steam engines in such places as rolling mills, dockyards, etc. Some interesting data in this connection are contained in a paper read by D. Selby-Bigge before a meeting of the Iron & Steel Institute, an abstract of which is to be found in the *Engineering Magazine* for December. Leaving out of consideration, however, the substitution of motors for steam engines, there remain three forms of application of the principle of special interest to the mechanical engineer, namely; the driving of isolated tools where convenience is the chief consideration, the grouping of a number of machines around a motor, admitting of an undivided number of combinations, from that of two or three machines to that of all those on the same floor or in the same shop, and the building in of a motor as a part of each machine tool.

There are several examples in this country of the first method, among the best known of which are those of Fraser & Chalmers and the De La Vergne Refrigerating Machine Co. The aggregate capacity of motors in the erecting shops of the latter firm is 75 H. P. It is found by experience that a single 40 H. P. dynamo is sufficient to supply these motors, although at times it is rather severely taxed. The average H. P. supplied by the driving engine during a test extending over six weeks was 24 H. P. As this engine was of 100 H. P. in view of possible extensions, we may deduct 10 H. P. for friction, leaving an average of 14 H. P. supplied to the dynamo. Such a plant might, if desired, be run with a 20 H. P. engine, using storage batteries.

Regarding the second method, the installation at Herstal, Belgium, furnishes much more valuable data. Here the plan was chosen and carried out from the start without the compromises usual in remodelling plants already in operation. A reprint of two important papers,

varying the speed of each of the elements independently of the others; the possibility of starting and of suddenly increasing the power demanded without shock to the rest of the system; transmitting shafts need no longer be absolutely parallel, but can be put in all directions, and plans for workshops can be made irrespective of shafting.

Mr. Melotte supplies a most interesting study for the technical details. He enumerates, among other advantages: the complete independence of each main shaft; the stopping of one shaft without stopping the whole factory and without having to use intricate and expensive devices for this purpose; the possibility of throwing a shaft in again which has been stopped, which is generally not the case with other systems. This system permits of overloads as easily as any other; thus motor No. 5 at the Herstal factory, the normal output of which is 16 H. P., ran for several days at 30 H. P. without inconvenience. The motors are provided with an apparatus which cuts out the current automatically when the load runs above the limit. The motors are not cumbersome. Unlike other devices they can be put in a corner, and the conducting wires will follow the ceilings or the walls or are carried underground. This system adapts itself with remarkable facility to any increase in the plant.

The installation at Herstal consisted of nine 16 H. P. motors, two 37 H. P. motors, and five varying from 21 H. P. to 3 H. P. Each of these, except two, drove a line of shafting. The guaranteed efficiencies were 90 per cent. for the dynamo, 98 per cent. for the conductors, and an average of 87 per cent. for the motors, giving a total efficiency of 76.6 per cent. at the motor. Although at Herstal this efficiency is superior to that which anyone was willing to guarantee for mechanical transmission, it is inferior to the recorded efficiencies in some American machine shops. It must be remembered that in comparing these shops with the Herstal factory the friction of the shafts driven by the motors is still to be accounted for in the latter. Many of the advantages enumerated by Messrs. Casterman and Melotte apply particularly to the motor coupled directly to each tool. By the multiplication of small motors the efficiency will be considerably reduced and the caretaking increased. So far as is known there is no machine shop in this country equipped in this manner unless perhaps that of the Crocker-Wheeler Company. At St. Etienne, France, a silk factory equipped with over 100 motors, ranging from ¼ up to 1 H. P. of low efficiency, has given



without any trouble from sparking. The only motors given us ran at a 1,150 to 1,500 revolutions, necessitating gearing. With those running at 250 to 300 revolutions the conditions are vastly improved. I do not think it is possible to stop and start, economically, in running a lathe, and I should think for some time to come we shall have to be content with grouping lathes and machines on a certain length of shafting. I put in a 60-H. P. motor recently driving a band saw. It is particularly adapted to that work because the power was proportioned to the varying work consequent upon the varying thickness of the tapering logs sawed.

Mr. Davis spoke of the great economy resulting from taking the machine to very heavy pieces of work instead of taking the work to the machine.

Mr. HENDERSON: There is another advantage—that of arranging the windows and also the roof trusses in the shop without reference to their necessity for supporting lines of shafting.

Professor Crocker recommended a voltage of 250 or 300 volts, giving low cost of wires and being entirely safe. For short distances 100 to 110 volts would be enough. Also, two incandescent lamps in series of the same system, or the three-wire electric lighting system, could be used.

Mr. Hunt called attention to the necessity of paying attention to high voltage on account of insurance rates.

Mr. Ayer qualified Professor Crocker's statement about the voltage. He recommended for general practice a 110-volt current both for maintaining insulation and for freedom from accidents.

Professor Crocker gave it as his opinion that carbon brushes have scarcely sufficient conductivity to operate for 110 volts. He said that power circuits in the West are universally 500 and 600 volts, insulation being perfectly maintained.

The Chairman, Mr. Henry R. Towne, summed up the discussion and called attention to the altered conditions in shops other than machine shops, where all the machines are used as much as 70 or 80 per cent. of the time.

March 13, Mr. W. B. Parsons, Chief Engineer of the Rapid Transit Commission, will open the discussion with an illustrated paper upon the rapid transit problem.

#### The Quality of Steel Axles as Shown by Etching.

The truck axle of Engine No. 193 in passenger service on the Cleveland, Cincinnati, Chicago & St. Louis Railroad broke Oct. 27, 1894, when one mile from Cleveland. This axle had been put under the engine in January, 1893, the time in use having been 22 months.

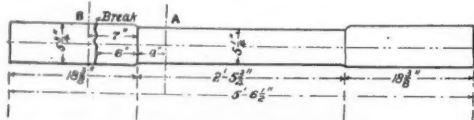


Fig. 1.—Sketch of Axle.



Fig. 2.—Etching of Section at A.



Fig. 3.—Etching of Section at B.

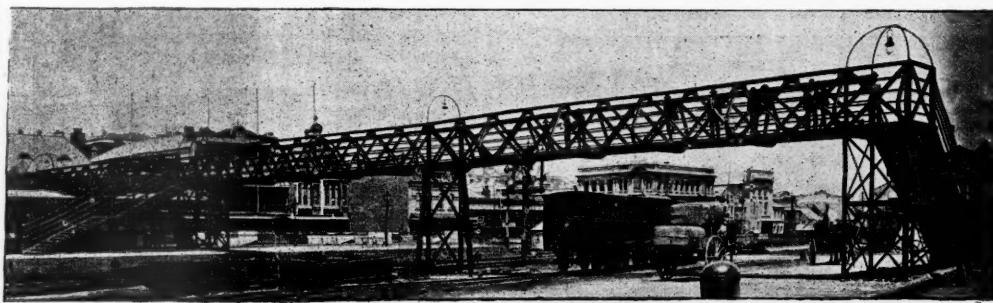
The location of the break is shown in the sketch, Fig. 1. This axle had been tested and accepted by the testing

laboratory in Pittsburgh, and there was nothing to indicate a weakness. The pieces were brought into the shop and cut off at A and B, Fig. 1. These sections were highly polished, and still no indication of a defect was observed, the whole surface taking the polish alike. The sections were then etched by a mixture of sulphuric acid, nitric acid and water, and impressions taken. Fig. 2 shows the impression of section at A and Fig. 3 the one at B. The light spots in each show where the acids attacked the metal, the depth of the etching in some spots being as much as  $\frac{1}{8}$  in. The hole in the centre of Fig. 2 and the circles in Fig. 3 are the results of trimming up the sections. Around the edges of both sections the action of the acids was comparatively nothing, as

cisco being a large customer for the Newcastle coal. The city has a population of 51,000 persons and is connected with the capital, Sydney, by railroad.

In carrying out economies the Railway Commissioners directed that old rails should as far as possible be utilized, and the Newcastle footbridge is an instance of the profitable use of old materials. The bridge provides communication for foot passengers between the station at Newcastle and the public wharves, and consists of three spans 63 ft. each, with a width of 6 ft. clear of the girders.

The main girders are of the lattice type, with a ratio of depth to span of one-tenth, with top and bottom flanges of 80 lb., steel T-rails jointed with ordinary fish plates



A Foot Bridge of Old Rails.

is plainly seen, the action on the metal being where the metal had blowholes that had not been closed up by the hammer, or contained cinder. It is quite possible that the hammer used in forging was too light, the effect of which was to consolidate the metal on the surface, without working the interior of the mass. An Indian government engineer recently refused to use hammered steel axles, but requires rolled bars reduced

and cover strips. The struts are of old 75-lb., double-headed rails, and the ties of 5-in. bars of varying thickness, each tie having two bars (one on either side of the strut). Stiffeners are placed 12 ft. 6 in. apart, and consist of old 71½-lb. iron rails curved and jointed under deck with old fish plates. The wind-bracing is of 2½-in. bars. The trestles are built with 80-lb. steel T-rails and 75-lb. double-headed rails and bars 3 × ½ in. as bracing.

All connections are made by shaped junction plates of varying thicknesses, according to position, and all holes are punched and reamed.

The 80-lb. steel rails in the booms and trestles are new, having slight defects rendering them unfit for use in tracks. For the booms the best were selected so that the flaws were cut out. The 75-lb. D.H. and 71½-lb. T iron rails were old rails, the best being selected. The timber deck consists of 4 × 2 in. planking carried on 5 × 3 in. joists placed 3 ft. apart. The treads to stairways are 2 in. thick and risers 1½ in. thick, with 10-in. stringers bolted to the old iron rail stringer for additional strength.

All timber work is of hardwood.

Old stones, being available in the district, were used instead of the concrete shown on drawings, and on which cast iron shoes were placed to receive the trestle legs. The total weight of iron work is 41½ tons, and there are 650 ft. of hardwood fixed. The total cost erected, including painting, lighting, etc., is \$4,425.

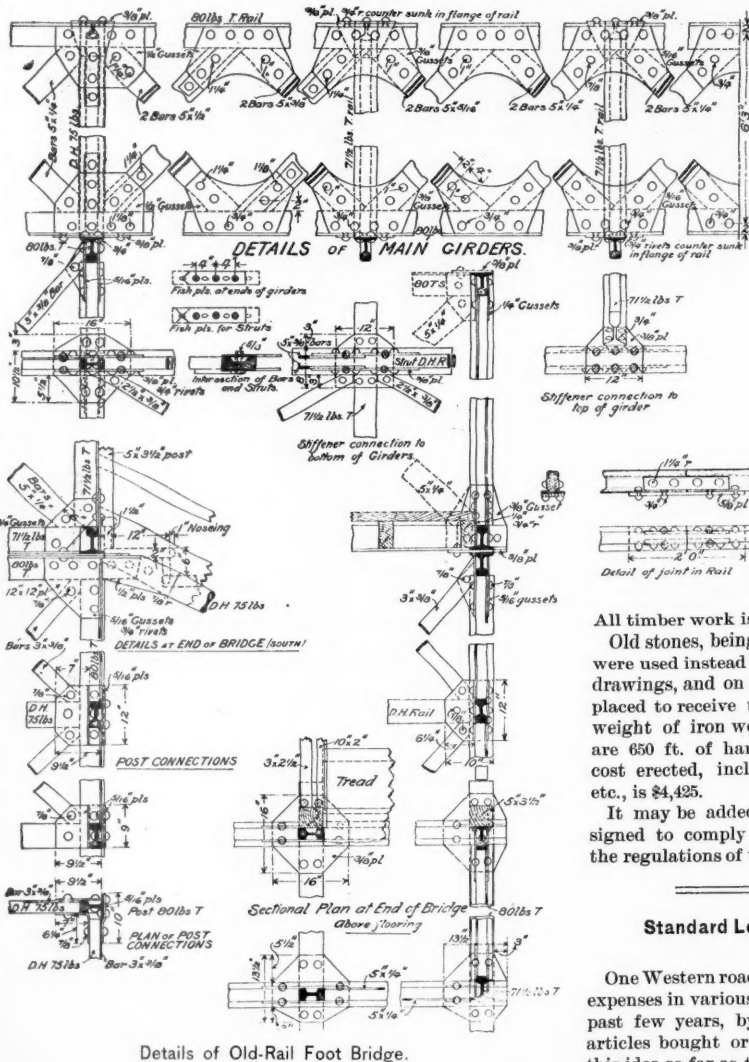
It may be added that the bridge was designed to comply with the requirements of the regulations of the English Board of Trade.

#### Standard Lengths for Bridges.

One Western road which has largely reduced expenses in various departments during the past few years, by reducing the variety of articles bought or kept in stock, has carried this idea so far as to adopt standard lengths for iron truss bridges. At first thought this

would seem to be doubtful economy. In so large a structure as a bridge the additional cost of each lineal foot is so much, that to increase the length beyond what the waterway requires would very soon enhance the price much more than could be saved by using fewer plans or making duplicate bridges. But on a road with numerous long lines, on some of which the growth of business is much faster than it is on others, other considerations come in, and these are stated by an officer of the road in question as follows:

"Answering yours of the 25th, the chief economy in having iron through trusses of even lengths, and of a few sizes, is that you can put the older ones out on the branches as heavier ones are needed for the main line. Our lengths are 110, 132, 154 and 176 ft. All Howe trusses put up anywhere on the branches with masonry abut-



Details of Old-Rail Foot Bridge.

from a bloom of specified size, to insure thorough working. He then turns a wheel seat and journal, with large fillets, and will not allow the middle of the axle to be reduced.

Both chemical and physical tests failed to show the defect, which is brought out here so plainly. We are indebted to Mr. J. A. Lawes, Mechanical Engineer of the Cleveland, Cincinnati, Chicago & St. Louis Railroad for this information.

#### A Footbridge of Old Rails.

The engravings show a footbridge erected under the direction of the Railway Commissioners of New South Wales at Newcastle. This city is the center of the principal coal field of New South Wales, from which about 2,000,000 tons of coal are exported annually, San Fran-



ments are either to be replaced by the 110 or the 132 ft. iron spans. For anything lower than 110 ft., when renewing in iron, we use plate girders, using 60 to 75 ft. for the center one. In this way we do not have to scrap any of our old bridges, and we may virtually say we save two-thirds the cost of the iron work for a new bridge when one is needed on a branch; that is, the cost of a new bridge, less the scrap value of the old one.

"As to waterway, we can always work in one of our standard plans; sometimes making the new opening a little smaller and sometimes a little larger than the old. The local conditions govern very largely. We have two 110-ft. spans which were bought last year for one place which we intend to use now in an entirely different place, on another road in our system. Having the abutments uniform will take these two spans out of our material stock and save the investment of more money for the time being."

### Railroad Renewals.

BY MR. JOSEPH O. OSGOOD, M. AM. SOC. C. E.

The writer has repeatedly observed, in looking into the condition of railroad companies, an omission to make provision in the annual maintenance accounts and expenditures for a proper portion of certain classes of renewals. The renewals specially referred to are those of rails, ties, rolling stock and other items which last many years in service. As they cannot be said to require replacing until worn out, there is, during the history of all roads which are new or have recently been reorganized and largely rebuilt, a period during which much less

\$5,221 per mile, and expending but \$773 per mile for maintenance of way, etc.

The above will serve to show what the expenditures are, but it is not easy to determine what they should be.

In endeavoring to get some light on this subject, the statistics of a number of roads were taken from Poor's Manual, all for the year ending in 1893, and analyzed with the aid of the annual reports to the stockholders, so far as these were obtainable.

Thirteen roads, aggregating 8,332 miles, with gross earnings per mile averaging \$6,243 (\$5,300 to \$6,760) showed charges to maintenance of way of \$450 to \$1,090 per mile, averaging \$850. An examination of the annual reports of nine of these roads indicates a failure in nearly every case to provide for all classes of renewals. In some no new rails or new ties, or entirely insufficient amounts of them, were included in maintenance accounts, and there appeared to be few cases in which any excess over ordinary renewals was shown for any item; although the reports as a rule appear to make the most of anything which could by any possibility be termed an improvement. Taking this 8,332 miles together, the reports would indicate to the writer that the average charge for maintenance would have been nearly \$1,100 per mile, if a proper share of renewals had been provided for.

Again, five large systems, with more than 22,000 miles of road, the earnings of which averaged \$5,857 per mile (\$4,000-\$7,700), had maintenance expenses averaging \$862 per mile, ranging from \$629 on the road of least, to \$1,054 on that of greatest earnings. In this case the reports indicate that the proper average, including renewals, could hardly have been less than \$1,050.

The items which make up this allowance vary much with the special conditions, but the following divisions will perhaps fit some cases, and is offered as a suggestion

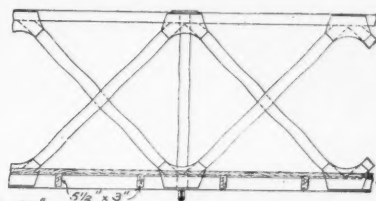
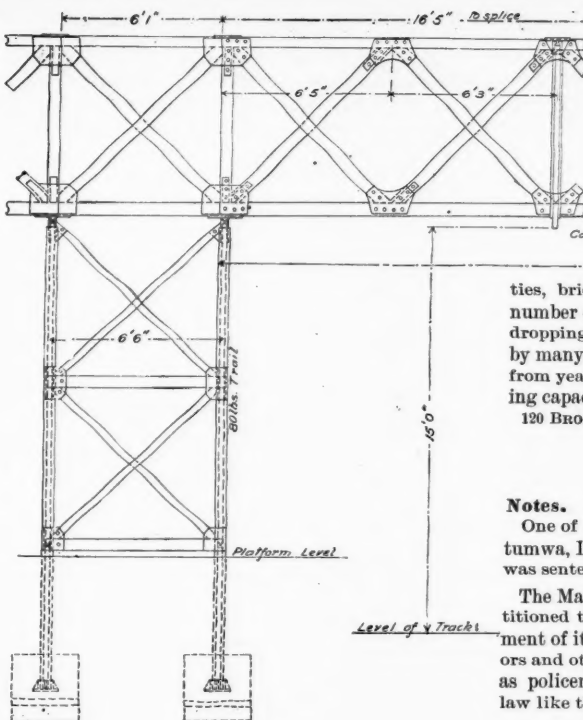
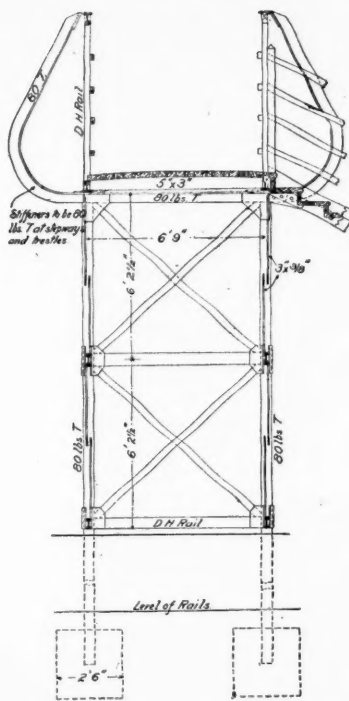
### Maintenance of Way and Structures Per mile of road—Average Railroad Earning \$5,000 per Mile.

Renewals of roadbed, culverts and masonry.....	\$125
" of bridges and trestles.....	125
" rails, fastenings and switches.....	150
" of cross ties.....	200
" of ballast.....	50
buildings, water stations, etc.....	50
General repairs track, etc.....	\$700
	300
	\$1,000

It will readily be seen that on the basis of the above division of maintenance expenses the omission of half the items classed as renewals, an easy matter on a new road, will permit of exceedingly low maintenance expenditures.

If the above estimates even approximate to the facts, they indicate that from 30 to 40 million dollars were omitted from the proper charges for maintenance in 1893, and the properties would have depreciated to that extent except for a corresponding increase in the capital account. They also indicate a policy in regard to a large class of railroad properties, which if continued must inevitably lead to endless bankruptcies and reorganizations.

The remedy would seem to be to meet the issue squarely year by year, and charge for deterioration and renewals before endeavoring to figure net earnings. This would involve the setting aside (on new roads at least) of a fund for the replacing of such items as rails,



ties, bridges, etc., which require renewal only after a number of years in service. It would involve also the dropping of "construction" or "betterment" accounts by many roads which now add to their capitalization from year to year without adding a dollar to their earning capacity or value.

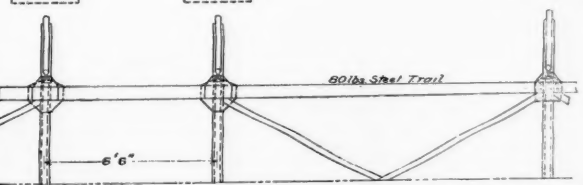
120 BROADWAY, N. Y., Feb. 13, 1895.

### THE SCRAP HEAP.

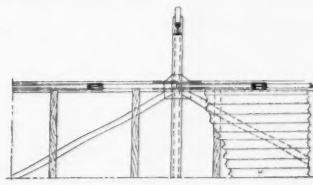
#### Notes.

One of the men who robbed an express car near Ottumwa, Iowa, on Jan. 12, pleaded guilty on Feb. 13, and was sentenced to five years' imprisonment.

The Massachusetts Street Railway Association has petitioned the State Legislature to authorize the appointment of its conductors as railway policemen. Conductors and other employees of the steam railroads have acted as policemen in Massachusetts for many years under a law like that here referred to.



A Foot Bridge of Old Rails.



than average repairs and renewals are necessary to keep the property in good condition. During this period the fact that rails, ties, etc., are deteriorating in value is apparently forgotten and the annual reports show very low maintenance expenses, often accompanied by a statement by the manager of the property that the road has been fully maintained, and that it is hoped that the already low operating expense can be still further reduced in the future.

This policy of ignoring the deterioration from year to year, until it requires so-called "extraordinary expenditures" and "betterments" to again put the road into good condition, appears to be widespread and to offer a serious menace to the stability of railroad prosperity in this country.

Confining inquiry to the one item of Maintenance of Way and Structures, the following table is compiled from the report of the Interstate Commerce Commission for 1893:

	Miles of road.	Operating earnings, per mile.	Maintenance of Way and Structures.	
			Per mile	Per cent. of oper. exp.
United States: Total roads represented..	169,780	\$7,190	\$997	20.45
U. S. Group I.....	7,420	11,711	1,609	20.37
" II.....	19,271	16,240	1,907	17.83
" III.....	21,756	8,612	1,212	19.59
" IV.....	10,561	4,151	698	21.11
" V.....	17,005	4,796	755	22.12
" VI.....	39,975	6,133	848	21.26
" VII.....	10,424	4,547	655	22.32
" VIII.....	21,214	5,044	772	22.33
" IX.....	10,200	4,118	726	23.30
" X.....	11,933	5,501	840	23.49

Omitting the New England and Middle States' roads (Groups I. and II.), there remains a total of 143,088 miles of road earning \$5,737 per mile, and expending \$840 per mile on maintenance of way and structures. Omitting also Group III., which includes the large earners east from Chicago, we have 121,332 miles of road earning

Again, taking 15 roads, aggregating 7,658 miles, and earning \$3,300 to \$4,900 per mile (averaging \$4,341), the maintenance expenses averaged \$688 per mile and ranged from \$536 to \$905. An analysis of the reports indicates that an average of \$950 would probably have been necessary to fully maintain the properties, and that but two of the roads, and both of these in New England, provided fully for renewals.

Again, grouping five roads with an aggregate length of 1,714 miles and average earnings of \$2,129 (\$1,622-\$2,430), the average maintenance charges were but \$389, ranging from \$241 to \$476. This group could probably have fully provided for renewals by an expenditure of \$800 per mile, but certainly could not with the expenditures actually incurred.

The above groups of roads were at the date of their reports (1893) of standard gauge throughout, and none of them was in the hands of a receiver. The larger earners, on which renewals play a less important part in the totals of maintenance, have not been included.

The figures furnished by the annual reports referred to serve only to give some details of the expenditures, and the figures estimated by the writer are offered only as a rough approximation, which might be materially revised with more data at hand. It is evident that no one can judge accurately of the proper allowance for renewals on any particular road without close examination, not only of the accounts, but of the property itself and the its business. So far as the above figures indicate anything, they point to an allowance of about \$1,000 per mile as necessary for full repairs and renewals on ordinary roads of about \$5,000 per mile annual earnings.

The *New York Times* prints extracts from the records of an English court in which it appears that three men who placed timbers on a railroad track with the intent to wreck an express train, were sentenced to imprisonment for only six months, while another man, brought before the same court, for setting fire to a haystack, was sentenced to three years' penal servitude.

Workmen in the shops of the Lehigh Valley are signing a petition asking the company to furnish employees tickets over the road at the rate of one-half cent a mile, instead of giving passes. One of the men circulating the paper says that if the petition is granted it will do away with a great deal of jealousy and fault-finding among employees, some of whom complain of favoritism shown to the wives and daughters of certain other employees in the distribution of passes. At Sayre the petition was signed by 491 of the 500 employees, while at Wilkes Barre 90 per cent. of the shopmen attached their signatures.

The much-advertised suit of Frank E. Beach, Prosecuting Attorney of Henry County, Indiana, for 2,001 penalties for the failure of the Cleveland, Cincinnati, Chicago & St. Louis to bulletin passenger trains on a blackboard at a small station, still furnishes material for the space writers, and it is said that Mr. Beach, who hopes to get half the proceeds, will appeal to the Supreme Court if he does not succeed in the trial now begun. The main item of interest in connection with the case at present is the fact that some typewriter will get a six-weeks' job transcribing the 800,000 words in the documents connected with the case.



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## EDITORIAL ANNOUNCEMENTS.

**Contributions.**—Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies in their management, particulars as to the business of the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and railroads, and suggestions as to its improvement. Discussions of subjects pertaining to ALL DEPARTMENTS of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.

**Advertisements.**—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. We give in our editorial columns OUR OWN opinions, and those only, and in our news columns present only such matter as we consider interesting, and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers, can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.

A very negative sort of encouragement is to be drawn from the tabulations of gross earnings for January as made last week by the financial papers. The *Chronicle's* returns from 132 roads show a gain of \$25,618, the total earnings being \$36,871,674. That is, the gain was practically nil. *Bradstreet's*, also from 132 roads, shows a loss of \$113,741, or three-tenths of one per cent. This small gain or loss, whichever it may have been, followed on a tremendous loss in January, 1894, viz., \$4,819,853, or 12.25 per cent., for 123 roads. Of course, the reader understands that we are dealing with comparative figures only. These monthly tables do not contain the results on several of the big systems, hence the loss in January, 1894, and again in January, 1895, was really a good deal more than shows in these figures. But they give in a measure a fair indication of the trend of things; and they show that the railroads are a trifle better off or worse off this year than they were last year, when they were in a wretched plight. The sad story of the months is told in the following little table of percentages of increase or decrease taken from *Bradstreet's*:

	1891.	1893.	1894.	1895.
January.....	Dec. 12.0	Inc. 5.0	August.....	Inc. 1.0
February.....	Dec. 12.0	Inc. 3.4	September.....	Dec. 13.0
March.....	Dec. 13.0	Inc. 4.7	October.....	Dec. 9.7
April.....	Dec. 14.1	Inc. 3.5	November.....	Dec. 2.3
May.....	Dec. 17.0	Inc. 8.9	December.....	Dec. 6.6
June.....	Dec. 22.0	Inc. 5.2	Year.....	Dec. 11.0
July.....	Dec. 19.0	Dec. 4.1		Dec. 2.1

The January and December showing by groups is given in the following from the same journal:

	Jan- uary, 1895.	Decem- ber, 1894.		Jan- uary, 1895.	Decem- ber, 1894.
Grangers.....	Dec. 9.6	Dec. 10.1	Southern.....	Dec. 1.7	Inc. 4.2
Cent. West.....	Inc. 6.4	Inc. 3.5	Southwest.....	Inc. 4.2	Dec. 1.4
Trunk.....	Dec. 3.5	Inc. 1.4	Pacific.....	Dec. 6.6	Dec. 5.0
Coal.....	Inc. 3.1	Inc. 8.9	Total.....	Dec. 6.6	Dec. 1.1
Eastern.....	Dec. 3.0	Dec. .08	Mexican.....	Inc. 6.7	Inc. 6.9

For reasons now familiar enough the grain carriers were the greatest sufferers. The St. Paul lost over a quarter of a million and the Rock Island \$188,000. The Northwestern and the Burlington do not appear yet. The Canadian Pacific lost \$221,000, the Missouri Pacific \$184,000 and the Grand Trunk (five weeks) \$109,000. These were all the losses of over \$100,000. The Missouri, Kansas & Texas gained \$224,000 and the C., C. & St. L. \$101,000. There were no other gains of as much as \$100,000.

The Central traffic lines doing business eastward from Cincinnati have made an agreement concerning the division of passenger business, and, according to the press dispatches, the percentages have been settled. The agreement applies (1) to tickets used in excursions, (2) by employees, (3) on account of charity, and (4) all sold at special reduced rates. It applies on business to New York, Boston, Philadelphia, Baltimore and Washington, and the percentages are:

	B. & O.	Penn.	Erie.	C. & O.	C., C. & St. L.
To New York.....	20	15	30	20	15
To Baltimore, Phila. and Wash'n.....	33 1/2	33 1/2	33 1/2	33 1/2	33 1/2
To Boston.....	..	..	15	..	85

This agreement went into effect on February 14, and it is the first division of traffic that has been agreed

upon since the association decided last October to try to settle differences in this way. It will be an interesting experiment, especially as it concerns business which, though actively fought for, is not complicated by such a perfect wilderness of perplexing side issues as are encountered at most large competitive points. The division of passenger traffic without money payments is not contrary to the fifth section of the Interstate Commerce Law, prohibiting pooling. This makes it perfectly legal to form such an agreement as this, provided it does not work an injurious "restraint of trade;" but it does not make it any easier for a traffic manager who is losing business to live up to it, and its perpetuity largely depends, therefore, on the promptness and fairness with which the percentages are readjusted or the rates are raised or lowered. Confining the agreement to only a small portion of the business may be a good thing; for it will be easy enough, if all parties are agreed, to take the condition of the regular passenger business into consideration when revising percentages.

In answering their trainmen's request for an advance in wages the officers of the Southern Railway have taken the admirable course followed by the Erie officers in 1890, of issuing a circular letter showing at considerable length the conditions which forbid any general increase. A condensation of this circular appears in another column. In the manner of presentation it is possibly not as effective as the Erie circular was; that it is colder and more purely a statement of fact without argument. For some audiences this would be better; for the audience concerned it may not be as good a method. At any rate, the demand of the employees did not contain such unreasonable features as in the Erie case. The Southern's facts make a powerful case just as they are, and any conductor or engineman can appreciate the force of the tabular comparisons presented, if he will stop to read them; and so far as we can see they are unanswerable. A road which loses from 10 to 17 per cent. of its business, while paying its bondholders nothing, or next to nothing, is forced to scrimp in every direction possible, and we do not see how the employees could in such a case argue for the maintenance of wages except on the ground that neighboring roads paid more. We do not hear of any such claim in this case, and even if such grounds existed it is of very doubtful expediency to present them at such a time as this. Indeed, the shrinkage in all values is one of the points which we should like to have seen stated with more fullness. And if the railroad employees of the South believe, like some of their brethren in other states, that they ought to act as railroad men in political matters, a kindred point that ought to be emphasized is state control of rates, for two of the states traversed by this company's lines, South Carolina and Georgia, have reduced rates more savagely than some Northern States which are a good deal more talked about.

This adjustment of wages is an illustrative case where consolidation of railroads has worked to the advantage of employees, for it appears that some of the men on the East Tennessee got smaller pay than the same grades on the Richmond & Danville, and have now been advanced to an equality with the latter. The best result of the present transaction, however, is the printed circular. The superiority of this, a statement seen by every employee, over a verbal statement to a committee composed of men who, half of them, are generally self-appointed, is very great. Sir George Findlay's first and most important prescription for the prevention of strikes was "to arrive at a good understanding" between the employer and employee, and such a statement as this tends powerfully to produce that result. It is over four years since the Erie people made the statement above referred to and most people have forgotten it; so much so that the present action of the Southern's officers is spoken of as "unique." There have been strikes during the past four years which might very possibly have been prevented by just this course. It is to be hoped that these two examples will be remembered. The immediate effect of the Southern's circular is yet to be seen. Press dispatches of Wednesday report that the committee of employees which has been in Washington a week or two has decided not to accept the rates offered by the company at present, and has called upon the various brotherhood chiefs to come to Washington.

## The Class "P" Locomotive of the Pennsylvania.

The Pennsylvania express locomotive class "P," quite completely described in another column, is an example, and a good one, of the tenacity with which a

railroad can safely cling to a standard design of locomotive when that standard is properly selected. The original design of this locomotive, modified from the class "K," under the direction of Mr. T. N. Ely, in 1886, is still retained, for the most part, in the present locomotive. Modifications were made in 1890, but the principal standard dimensions were retained, as they have been in the latest modification, which is shown by the illustrations in this issue. For the purpose of reducing the shop repairs by duplication of parts, the principal features of the original design have been preserved and the Pennsylvania Railroad has reaped the advantage of duplication of parts quite as much as other roads in this country that have held to old and inferior designs for the sole purpose of maintaining standards, and yet there has never been a time when the class "P" locomotive could have been said to be behind the best practice in eight-wheel construction. This important result was reached by making a scientific design originally.

Although the class "P" locomotive has been, and is to-day, one of the best of eight-wheel locomotives, it is a question whether the eight-wheeler has not become inadequate for fast, heavy passenger service and is not destined to be replaced by the mogul and the 10-wheeler, which are after all, simply the eight-wheeler with one pair of drivers added. The eight-wheel type has all the adhesion that is needed when the train is moving at considerable speed, say from 30 miles an hour up; but in starting out and in working slowly, on heavy grades, and with side winds, and in snow storms, an eight-wheeler, even with 87,300 pounds on drivers, as in the case of the class "P," is not as powerful as is often needed. The limit of passenger locomotives to haul trains at high speed is, however, not reached in the adhesion, but in the capacity of the boiler to make steam, and in this the 10-wheeler has the advantage, as the boiler can be made larger in diameter and can have a larger grate and firebox area without exceeding a reasonable weight per wheel.

However, the question as to which is the proper type of locomotive for heavy, fast passenger service, the six-coupled or the four-coupled, cannot be decided irrespective of the local conditions of track and service, and the same train may require a 10-wheeler on one road, while it can be hauled with an eight-wheeler on another.

To show how the demands of service have caused an increase of weight and nearly an equivalent per cent. of increase in weight of steam per minute, and, further, to show that a corresponding increase has not been made in the steaming power of locomotives in this country, the class "P" is a good example. The engine was built in 1886 with pretty nearly the maximum length of firebox that can be fired properly from one end; that is 10 feet. The width was 41 1/2 inches. The same length of grate, 40 inches wide, is on the present engine, but the weight on drivers has been increased from 67,800 pounds to 87,300 pounds; that is, the adhesion of the drivers has been increased 29 per cent., and if this adhesion may be taken as representing the increase in the demand for steam per minute, and about this there is a dispute, then there is something striking in the fact that the grate area has been reduced about 4 per cent., bearing in mind that the speed has been increased considerably. What has been found in the tests that have been accurately made with boilers of different kinds points to the conclusion that it is not economical to exceed a certain rate of combustion per square foot of grate per hour, or to use more than a certain gross amount of fuel per hour per square foot of heating surface, and it is quite evident that nearly all locomotives in this country hauling heavy express trains are running above the economical limits to the rates of combustion so indicated.

An important fact, and one that bears directly on this matter, is found in the results of the series of tests now being carried on by the students at Purdue, O. When the fuel used per square foot of grate per hour is increased from 72 pounds to 153 pounds, the evaporation of the boiler is decreased from 6.54 to 4.86 pounds of water per pound of coal. This is a reduction of efficiency of the boiler of 25 per cent. within the ordinary limits of operation. The fact is indisputable, but whether the loss is due principally to the forcing of the combustion on the grate or mainly to the forcing of the heating surface, or about equally to both, cannot be told from these tests.

Another way to look at this evidence is, that, if in a given boiler, the rate of combustion can be reduced from 153 to 72 pounds per square foot of grate per hour, the evaporation will rise from 4.86 to 6.54, and in this way give a saving of 33 per cent. This is a good test to talk about for the reason that the conditions are uniform and the results perfectly comparable, so that all discussion must be about the meaning of the results and not as to the fact.

One must conclude from this that, if the increased



weight of the present class "P" has been made necessary by the increased resistance of the heavy trains at higher speeds, considerably more steam is now demanded per minute, especially in view of the fact that the speed has been increased, and therefore that this locomotive, like all American locomotives, having exceeded the economical rate of combustion per square foot of grate in the original design, must now be working with less efficiency.

The "tractive power" is a very unsatisfactory and indefinite measurement, owing to the fact that it is generally based on a fraction of the boiler pressure, varying from 60 to 90 per cent., and is generally taken at about 80 or 85 per cent. For all purposes of comparison, it is just as well to take the full boiler pressure. In the table of dimensions for class "P" it has been given at 80 per cent. The tractive force of the original design was 13,560 pounds; it is now 15,163 pounds, which is an increase of 12 per cent. If this increase means anything, it means that more steam must be used per minute, at the same speed, and more still for higher speeds, yet the grate area remains practically the same, and the heating surface has not been increased in proportion to the apparent increase in the demand for steam.

The fact that the demand for steam from locomotive boilers in this country has been increasing faster than the power of the boilers to supply steam, at the same efficiency as formerly, has been pointed out in these columns before, and it is not alone true of the class "P," but of all locomotives, freight as well as passenger. The limit to which this increase can go without seriously affecting the efficiency of the locomotives is pretty nearly reached with the present designs of boilers, excepting, probably, those having large grates above the wheels, and at the present rate of increase even this last type will soon be inadequate to furnish steam at reasonable efficiency. If, in seeking for greater economy in railroad operation, it is found necessary to reduce as much as possible the cost of fuel, there will have to be some radical changes in train-loads, or speeds, and also some important extensions of locomotive designs. The coming tests at Purdue ought to show the loss in efficiency that arises from the forcing of locomotive boilers. At present it is not known how the efficiency is affected by doubling the demand for steam per minute.

#### The Pacific Railroad Debt.

We have grown accustomed to thinking of the subject of the Pacific Railroad Debt as one of those endless controversies which never come to any settlement. But it did seem as if some definite solution had at last been reached when the Reilly bill was reported to the House of Representatives. However, this hope was soon disappointed. Bad luck seems to pursue this unfortunate subject at every turn. Three weeks ago everyone thought that the course which the House would take was determined. Their committee on Pacific railroads had not only reported the Reilly bill favorably, but had succeeded in having three days set apart for its debate and for a final vote. On the strength of this, everybody, even the Wall street operators, assumed the success of the measure as a certainty. Two days later the House threw the bill back at the heads of the committee, and set everything at odds again. So we have not yet heard the last word on this vexed question, and it looks as if the present Congress would leave it in as complete confusion as any of its predecessors have done. Evidently the end is not yet. Still there is at last a ray of hope in this weary matter. The whole subject is rapidly coming to a crisis. We have almost reached the point where delay is no longer possible, and where those who try to block the way to any decision will find that the possibility has swept by them, leaving them to gaze after it, and wonder why they did not take their last chance. We are surely, and no longer slowly, reaching the closing chapters of the remarkable history of this Government claim on the Pacific roads, and this last episode is not the least astonishing.

What the Reilly Bill proposed was simply this: The refunding of the Government's claim in bonds of the railroad, bearing a rate of interest which could actually be paid by the company. It favored the Government, also, by enlarging the scope of its lien to cover the whole property and by providing a satisfactory sinking fund to secure the payment of these bonds at their maturity. In short, it was a plain business proposition, giving the Government an opportunity to look squarely at the facts, and to take its one remaining chance of saving its claim of \$116,000,000.

The three days' debate on this simple financial plan was rather startling. The very notion of actually settling this time-honored subject, which every Congress for twelve years has puzzled over and finally passed on

to its successor, raised a whirlwind of talk. The main object of these three days seems to have been to rake over all the old scandals, and to raise the dust of past quarrels which were well forgotten.

The picturesque dealings of the Crédit Mobilier, the big steals of over a generation ago, and the sins and mistakes of the long history of this property, committed by men who are now out of our reach, were rehearsed and condemned. Mr. Snodgrass, the leader of the opposition, grew very eloquent over these subjects. The bill was an evil thing in his sight, on ethical grounds. "If we pass it," he said, "we condone the sins of the men who wrecked this property."

Now the practical bearing of all this is a little obscure. Undoubtedly the gains of many of these men were what Mr. Snodgrass would call the wages of sin, but unfortunately it is beyond our power to get them back again. Just why this plain business proposal should be rejected on these sentimental grounds is rather hard to understand. But the house followed Mr. Snodgrass, and practically voted away the chance of saving \$116,000,000.

Whether the members who voted with the member from Tennessee, all realized that this was what they were doing may well be doubted. But that is exactly what the rejection of such a measure means. After the dust of this three days' debate has settled, the actual situation is just as clear as ever. The United States has her choice between giving up all hope of having her claim or accepting immediately some such compromise as that suggested in the Reilly Bill.

Mr. Snodgrass would say that this is a compromise with the devil. But unfortunately in this matter the United States stands between the devil and the deep sea. Here is a property overburdened with obligations far beyond its power to bear. There is emphatically no health in it. Its main line could not be sold in any market for more than enough to pay the first mortgage, a sum of over \$35,000,000. The claim of the United States comes after this, and is evidently of very problematical value at present. This very plain financial fact has been blinked at and disregarded by each succeeding Congress. The whole subject has been a great political nuisance; numberless committees and commissions have lost their way in search of a solution for the problem, and each Congress has taken it up with ever-increasing weariness, and failing of a solution, has put it off till the day after to-morrow. But this day after to-morrow has at last arrived. Another Congress cannot postpone the matter, if it wishes to have any hand in it at all. If it delays, the matter will pass out of its power forever. Foreclosure proceedings, already begun by the first mortgage holders, cannot hang fire much longer. The big property must be reorganized with all due speed, and, since the crisis of 1893 precipitated the whole situation, no more patchwork reconstruction is possible. Certain fundamental financial facts must be squarely faced, and Congress is bound to do this as much as any other ordinary creditor. The complete reorganization only waits for Congressional action on the question of the Government's claim, and if this is delayed a year longer the first mortgage will be foreclosed and this property sold to some syndicate which could put the whole on a sound basis. In the meanwhile the Government's claim would disappear beyond hope of recovery.

If the other alternative should be chosen, and the United States should buy in the property and attempt to operate it on its own account, we should have entered on the most doubtful financial scheme of the present generation, in regard to which we may safely say that the loss of \$116,000,000 would be a small price to pay for keeping out of it.

It is a little hard to discover the practical reasons of the opposition in refusing to pass this bill. There was so much talk about the sins of the past that very little was said about making the best of the present. Of course we are now paying the penalties for all the sins and mistakes in the past management of this battered and bruised property. But that is no reason for throwing the whole thing over in a fit of righteous indignation. It is to be hoped that this hot temper of Mr. Snodgrass and his followers may cool down, and so the long-suffering committee seems to believe, for it is again at work on the bill and intends to report it in a few days. An alternative amendment will be attached offering to compromise the claim for a certain amount of cash down, and it is earnestly hoped that this will be accepted and this weary subject decided once and for ever. What the House will do no mortal can tell, and it is possible it may turn sharply round and pass the bill. But no one can feel sanguine about it, and this Congress will probably join those which have gone before it, having said a great deal about this Pacific Railroad debt and having done nothing at all. Still we can at least take comfort in the knowledge that the final solution of this vexed problem cannot be put off beyond this year of 1895.

The last cold snap caused long interruptions in the ferry transit between New York and Brooklyn, and, in consequence, a remarkable precipitation of traffic on the cable railroad over the bridge between those two cities. During the full 24 hours of Saturday, the 9th, 224,589 passenger tickets were sold, or 964 more than on the principal day of the week including the Columbus Festival, in October, 1892. This great number of people was carried without much increase in train service over that usually rendered; while, during the Columbus Festival, the probable demand was foreseen and provided for by running on the day mentioned about one-third more trains and cars than generally are in use. The following table gives a comparison of the service rendered on these two days; also of the number and kind of tickets sold and of the receipts therefor:

TRAFFIC OVER THE NEW YORK & BROOKLYN BRIDGE RAILROAD ON TWO HEAVY DAYS.

Number of round train trips made and headways.	Wednesday, Oct. 12, 1892.	Saturday, Feb. 9, 1895.
Minutes.....	15	7
".....	7½	22
".....	6	1
".....	15	15
".....	68	125
".....	3	90
".....	2¼	68
".....	40	84
".....	2¼	136
".....	1¾	346
Average headway.....	2 min. 4 sec.	2 min. 38 sec.
Total number of trains run.....	697	548
"..... single round car trips made.....	2,622	2,021
Average number of cars per train.....	3.76	3.69
Total number of passengers carried.....	223,625	224,589
Average number per car.....	12.6	55.6
Tickets sold:		
In packets of 10, at 2½c. each.....	80,340	76,340
"..... 2, at 2½c. each.....	143,285	130,172
Single tickets, at 3c. each.....	\$6,307 05	24,077
Total receipts.....	2.82c.	2.53c.

It may be said that, had the tickets sold on Saturday last, of each kind, been in the same proportion and for the same prices as on the other day mentioned, the receipts therefor would have been nearly \$600 (precisely, \$599.11) greater than they were. Another interesting fact, tending to show that at certain times passengers will submit to be densely packed into cars—that, though the average number carried per car the round day, and in trips to as well as from Brooklyn, was but 42.6 on the first day named, it was over 1¼ times this, or 55.6 on the second day named; and this in cars having but from 40 to 44 seats each. Doubtless on many trains when the traffic was greatest, and for a considerable time, more than 150 persons were on each car.

The quickening of the speed of the Chicago, Milwaukee & St. Paul fast mail was noted in the *Railroad Gazette* of Feb. 15, page 110. A correspondent sends the following more complete statement: The time from Chicago to Milwaukee, 85 miles, is 1 h. 50 min. The train is hauled over this division by an eight-wheel 18x24-in. engine, with 68-in. drivers and a 53-in. boiler. The first train on this schedule left Chicago, Sunday, Feb. 10, at 3 a. m., and reached Milwaukee on time, notwithstanding the snow and extreme cold then prevailing. The average speed between stations was 46¾ miles an hour, but this was lowered by the necessity of running slowly in the city limits, the average speed between yard limits being 53.65 miles an hour. The average time over the whole run of 420.1 miles is 38.18 miles an hour, including all stops. The time from Chicago to St. Paul is reduced to 11 hours, from 11 hours and 55 minutes.

Another aspect of the fast mail question is presented in a recent editorial of the *Sioux City Times*, which seems to show that, as usual, it makes a difference whose ox is gored. The *Sioux City* man would doubtless like to have the people of his neighborhood get their news from the local papers—a desire which editors in other cities share. He says:

The Chicago, Milwaukee & St. Paul has agreed at last to make the fast mail train somewhat faster between Chicago and Minneapolis. But the train is still held at Chicago till 3 o'clock in the morning. It might just as well leave Chicago at 1 o'clock, except that it is held back two hours so as to be a part of the special private carrier service of three or four Chicago morning papers. The slow fast mail train from New York arrives at 11:55 in the evening. Its mail could easily be transferred by 1 o'clock in the morning, if the purpose was to serve the public. But the so-called fast mail train from New York could just as easily be made to arrive in Chicago several hours earlier. It is held back, too. The whole thing is wrong. It is prostitution of the public service. If the publishers of Chicago morning newspapers want trains at 3 o'clock to carry their issues, why, let them pay for them, just the same as any other private person has to do.

The question of the reasonableness of the compensation paid by the Government to the railroads for fast mail-trains, which was briefly referred to in these columns Feb. 8, has since been discussed at length in the Senate, when the Post Office appropriation bill came up, but after two or three days of debate on the bill all proposed changes were voted down and the rates, both for ordinary carriage and for special service, will remain as at present. Mr. Vilas, of Wisconsin, in advocating his amendment to authorize the Postmaster-General to use the appropriation in his own discretion stated that the Government paid the railroads \$2,000,000 a year for the use of cars which cost only \$1,600,000 in the first place. It



appears that there are 740 postal cars in use. In one year the Pennsylvania received over \$2,000,000 for transportation of mail and \$575,000 for the use of 59 postal cars; the New York Central received \$2,080,000 for transportation and \$425,000 for 50 postal cars. The discussion in the Senate as reported in the press despatches ignored the main feature in the case, which is that this extra payment is for extra speed and special service. Several senators referred to the "rent" of the postal cars as being twice what they cost, assuming that the ordinary rates for transportation of mails (computed by weight) fully reimbursed the railroads. But these rates are the same that are paid to other railroads for carrying mail at ordinary speeds.

The principal features of the great storm, as it affected railroads, were noted in these columns last week. Some roads, however, had not been cleared at the time that issue of the *Railroad Gazette* went to press, and the situation in many places, like those around Lake Erie, where the snow storm continued longer than elsewhere, cannot be effectively reported at this distance. The Wilmington & Northern, from Wilmington, Del., to Reading, Pa., was closed eight days, the first through train arriving at Reading on Feb. 15. The Port Jervis & Monticello was opened through on Feb. 14 for the first time in six days. Some branches of the Pennsylvania in Southern New Jersey were closed four days. These items are samples of many concerning other lines in the territory where snow-plows are not plenty. The railroads of Alabama, Louisiana and Texas on Feb. 13 and 14 experienced their first snow blockade for many years. At New Orleans there was 15 inches or more, and trains were delayed many hours. At Galveston freight engines had to help the passenger trains, and some passenger trains were even omitted entirely. The Sunset Limited of the Southern Pacific arrived at Houston on the night of the 14th, three hours late, with two engines. The only snow-plow available on these southern roads was the device familiar to some northern railroad men in their former days of poverty—boards fastened upon the cow-catcher. At several places in Texas the unfamiliarity of the trackmen with snow led to derailments, switches becoming clogged. The valuable service of the Rotary snow-plow on the New York Central is described in another column of this paper. The New York Central also did some very effective clearing with the Russell push-plow on the Western Division.

We have recently noticed (January 4) the action of the Chicago & Alton in issuing revised rules to employees regarding abstinence from intoxicating liquors. Since then the Chicago Great Western has taken similar action, and in one respect seems to have gone a step farther, having forbidden trainmen to board at houses with which a bar room is connected. It appears that liquor bills have been included in board bills. The Chicago & Eastern Illinois has issued a similar order.

#### NEW PUBLICATIONS.

*Pocket List of Railroad Officials.* Quarterly. Volume 1, No. 1. New York: The Railway Equipment and Publication Company, 326 Pearl street. Price \$1 per annum.

While there are various lists of railroad officers, some better and some worse, some very useful, and some little better than nothing, all of them suffer from a combination, in some degree, of a number of defects. They are cumbersome in form, or badly arranged typographically, or published at such long intervals that an important part of their information comes to be misinformation, or they were originally inaccurate. The publishers of the "Pocket List," of which the first issue has just appeared, propose to minimize all of these objections. They intend to publish the list quarterly, to arrange the names and titles in such a way that they may be quickly referred to, to classify the information and get it into compact form, to introduce certain new lists, and withal to make the lists absolutely accurate. We do not pretend to say that they have accomplished all these results in the first issue; it would be quite impracticable for us to examine the lists with such care as to judge of their accuracy. That we shall have to leave to be determined by use. But obviously they have made a fine start.

The list contains the names of officers in charge of railroads, private car companies, fast freight lines and transportation companies in the United States, Canada and Mexico. It also shows the gage of each road, the miles operated and the rolling stock. It contains, furthermore, a directory to associations of railroad officers and to railroad commissions, national and state. The first table shows the railroads arranged alphabetically and also with consecutive numbers, making this list easy to refer to from the index or from other tables. This first table gives under each title the miles operated, the gage and the rolling stock classified as to locomotives, freight cars, passenger cars, miscellaneous and total cars.

Then follows the body of the book which is another list of the same railroads, also arranged alphabetically and carrying the same consecutive numbers, but under the name of each railroad will be found the names and addresses of the officers, and these are arranged with a line or paragraph to each name and address, making it quite easy to pick out from the list the name that one wants. Moreover, the officers are classified under sub-headings as general freight agents, division superintendents, etc.

The next division of the guide, in magnitude and in order, is the alphabetical list of officials. By referring to this, one finds in its proper alphabetical place any name which he may be seeking with the title and with the number of the road on which this officer is employed. Then by turning back to the preceding numbered tables and lists further information may be found.

The next list is headquarters of officers arranged by cities. Here we find the states arranged alphabetically and the principal cities in each state; in another column are the list numbers of the railroads whose officers have headquarters in those cities. In still a third column are given hotels in the various cities, and in a fourth column the list numbers of the roads which enter those cities. Be it understood that the numbers are those which we have mentioned before as given to the railroads in the first alphabetical list and carried by these railroads right through the book in all the subsequent lists. This numbering is a convenient means of reference from one part of the book to the other.

On the whole, we are inclined to think that this list will be the most useful one of the kind that has yet been published because of its completeness and convenience, and especially because of its compact size; but we warn the publishers that they must make it *accurate* above all things.

*Harper's Weekly* begins this week the publication of a series of articles describing the progress of the Field Columbian Museum Expedition around the world. The reader will remember that Major Pangborn started out last fall with a corps of assistants to make a very extensive journey, and collect material of all imaginable sorts, bearing upon methods of transportation, for the Field Columbian Museum. With Mr. Pangborn went Mr. W. H. Jackson, the celebrated photographer, and Mr. Edward Winchell, an artist. It appears that *Harper's Weekly* is to have the sole right of publication of the illustrative material collected by Mr. Jackson and Mr. Winchell, and that Major Pangborn will, from time to time, write articles describing the progress of the expedition. The first installment, which appears this week, deals with Tunis, and has many pretty pictures, some of them of rather special interest to railroad men.

#### TECHNICAL.

##### Manufacturing and Business.

At no time in its history has the plant of the Youngstown Bridge Works been crowded with large contracts to such an extent as at present, the orders being sufficient to insure steady operations for many weeks.

The Smith Railroad Lubricator Co., Havemeyer Building, New York City, has been formed to introduce in the New England States, and also for export, Smith's axle grease and cooling compound, as well as headlight and signal oils. F. J. Jenner is President, and Elmer Fletcher, Treasurer. The company has obtained the exclusive right to manufacture the lubricant according to the formula of the late Arthur W. Smith, and has established works at Elizabethport, N. J. The compound has been extensively used by the Pennsylvania, Chesapeake & Ohio, Chicago & Eastern Illinois, and several other railroads.

The Westinghouse Machine Co. has developed an important foreign demand for its machines, and orders have been recently completed for three 150 H. P. compound engines, to Mexico; 200 H. P. compound, to Spain; 300 H. P. compound, to France; 150 H. P. compound, to Buenos Ayers; 800 H. P. compound, to Havana, Cuba, besides a number of smaller engines to Russia and elsewhere.

One of the most recent orders for its steam engines which the company has received, is one for a 150 H. P. compound of the latest type for Alaska.

The Union Switch & Signal Co. has brought suit against the Philadelphia & Reading railroad for infringement of automatic signal patents, by the use of certain devices put up on that road by the Hall Signal Co. It is understood that the suit covers the same points as those on which the Union Co. brought suit against the Hall Signal Co. early in 1894.

The directors of the Barney & Smith Car Co., of Dayton, Ohio, have declared the regular two per cent. quarterly dividend on the preferred stock of the company, payable March 1.

The Toronto Dredging Co., with a capital of \$50,000, is applying for incorporation in Canada.

The Dressel Railway Lamp Works, New York City, have recently received an order from the Metropolitan West Side Elevated Railroad, Chicago, for equipping its line with electric head and side lights or classification signals, tail lamps and switch lamps.

The Kalamazoo Railroad Velocipede & Car Co. has within a few weeks made some very important shipments on foreign orders. These contracts have included 18 of the company's No. 1 style of velocipedes, 9 of its No. 6 style of cars to Australia; 20 No. 7 push-cars and 6 No. 1892 velocipedes to Brazil; and 4 No. 8 inspection velocipede cars to South Africa, duplicates of equipment shipped to the same companies about six months ago.

The Standard Manufacturing & Construction Co. has been organized under the laws of New Jersey for the purpose of manufacturing and dealing in railroad supplies, particularly for electric and street railroads. The directors are: J. L. Bowles, E. P. Cowell, O. R. Saint, H. W. Douty and J. A. Webber. The officers

are: President, J. L. Bowles; Vice-President, E. P. Cowell; Secretary, O. R. Saint; and Treasurer, H. W. Douty. The offices of the company are in the Central Building, 143 Liberty street, New York City. The Webber patent car wheel brake and Dillman combination fender, which this firm will manufacture, is now being applied to a car of the Electric Traction Co., of Philadelphia, for service test.

##### Iron and Steel.

The following have been re-elected directors of the Maryland Steel Co.: Major Luther S. Bent, Frederick W. Wood, Col. Walter S. Franklin, Rufus K. Wood and E. C. Felton. The directors organized by electing Frederick W. Wood President and Edmund N. Smith, of Philadelphia, Secretary and Treasurer. Mr. Smith occupies the same position with the Pennsylvania Steel Co.

The Joliet Steel Co. and the tonnage men in the billet and converter department have come to an agreement and the mills will start up about March 1. These departments have been closed since Jan. 1, on which date the old scale of wages expired and the company proposed a new scale with a 25 per cent. reduction. The new scale is a reduction of 25 per cent., with the exception of certain special kinds of work. Two thousand men will be employed.

The Sharon Steel Casting Company's plant at Sharon, Pa., employing 400 men, will resume operations about March 1. The plant of the Aschman Steel Casting Company is undergoing repairs and will resume April 1.

Five 1/2-inch rolling and puddling mills of the Pennsylvania Bolt and Nut Works, and the guide and skelp departments of the Lebanon Rolling Mills resumed operations in full Feb. 18.

The Sargent Co., of Chicago, is very busy at its steel plant, making two heats a day and melting from 16 to 18 tons of steel daily.

The receivers of the New York, Lake Erie & Western have been authorized to purchase 1,600 tons of 80 lb. rails and 2,500 tons of 90 lb. rails at a cost not to exceed \$22 per ton for renewals.

##### Interlocking.

The National Switch & Signal Company has been awarded the contract for an interlocking plant at the crossing of the Toledo, St. Louis & Kansas City and St. Louis & Eastern, at Alhambra, Ill. This plant is to have an arrangement for controlling the operator, like that which the same company is putting up at Catlettsburg, Ky., for the Chesapeake & Ohio.

##### Interlocking on the Metropolitan Elevated.

The National Switch and Signal Company has received orders from the West Side Construction Company of Chicago for two large interlocking plants, one of 64 levers and one 44. These machines will be placed in steel towers the same as the 60 lever machine now being erected by the same company at Marshfield avenue, Chicago.

The 44-lever machine will control the approaches to the double-track rolling lift bridge at Market street, operating signals on both sides of the Chicago river. This bridge, which was described in the *Railroad Gazette* Oct. 20, 1893, and is similar to that described in this paper to-day, is in two parts, each of which lifts in a vertical plane to an angle of 60 degrees from the horizontal. Owing to the use of electricity as the motive power, the introduction of the third rail and the novel design of the bridges, the ground work for the interlocking is of special design. All signals will be operated by pipe connections and the work will embody all latest devices. The night signals will show red and green.

##### The Colbert Shoals Lock.

The contract for the construction of the lock at Colbert Shoals, on the Tennessee river, near Florence, Ala., has been cancelled by the officers of the United States Engineer Corps, and they will complete the work themselves. The contract has been running about two years, and little work had been done. The lock is one of the largest, if not the largest, in the country, the lift being 25 ft., and is designed to overcome the last and only remaining serious impediment to navigation in the lower Tennessee river. There are about 25,000 yds. of masonry to be completed.

##### The Northwestern Elevated Road, Chicago.

The contract for the superstructure of the Northwestern Elevated Railroad in Chicago was let on Feb. 14, and the work will begin at once. The Union Bridge Co. and the Elmira Bridge Co. secured the contract, which was for about 30,000 tons, and is understood to amount to over \$1,500,000. Delivery is to be made within 18 months. Some of the wealthiest capitalists in Chicago are interested in this road, and ample capital is on hand to push the work of construction.

##### Bids for New Torpedo Boats.

Proposals were opened at the Navy Department on Feb. 19 for the construction, exclusive of torpedoes and armament, of three metallic, twin-screw sea-going torpedo boats of 24 1/2 knots speed and about 138 tons displacement. This speed is to be maintained for at least two consecutive hours. The appropriation by Congress for the cost of the three vessels is \$450,000. Two classes of proposals were received, one conforming to the designs of the Navy Department, the other modified by the bidders. The Bath Iron Works bid for all three boats, department plan, \$426,000; J. H. Dialogue & Son, Camden, N. J. \$408,000; Columbian Iron Works, Baltimore, modified plan, \$292,500; H. Ramsey, Perth Amboy, N. J., five bids department plans \$378,000, \$347,700, modified plans \$438,000, \$378,000, \$347,000; Union Iron Works, San Francisco



department plan \$360,000, modified \$348,000, one boat, modified, \$243,000; Fulton Eng. & Shipbuilding Works, San Francisco, department plan, two boats, \$290,000; Iowa Iron Works, Dubuque, department plan, all three boats, \$411,000; Herreshoff Manufacturing Co., Bristol, R. I., modified plans, \$341,550, \$414,000, \$389,815, \$365,700, respectively, for all three boats. The Cushing cost \$788 per ton, the Ericsson \$946 per ton. The lowest bid for the new vessels was \$706 per ton.

#### Steel in 1894.

Mr. Swank, the Secretary of the Iron & Steel Association, reports the Bessemer production of the United States in 1894 as follows in gross tons:

	1894.	1893.
Ingots.....	3,579,101	3,215,686
Rails.....	1,014,034	1,129,400
For street and electric roads.....	155,196	133,423

The street and electric road rails are included in the totals given above, and the figures are only of rails known to have been rolled for these purposes.

#### Steam Heating in the Northwest.

A transcontinental train upon the Northern Pacific, steam heated, recently made a most satisfactory trip of over 2,000 miles, encountering temperatures in North Dakota of 40° below zero. Hitherto no such long distances have been made by steam-heated trains. Despite the cold, an even temperature of from 70° to 72° was maintained in the cars. The system used is the jacket system of the Safety Car Heating & Lighting Co., of New York City. The equipments were put in at the Northern Pacific shop at Como, near St. Paul, Minn.

#### Completion of the Jeddo Tunnel.

The Jeddo tunnel, five miles long, driven for the purpose of draining coal mine workings near Hazleton, Pa., has just been finished. These mines were flooded by the breaking through of surface streams, and have been abandoned for seven years. The working did not extend more than 450 ft. below the top of the mountains upon which they were located. This made the tunnel a possibility, the plan being to drive in from Butler Valley, five miles off. Two shafts were sunk and boring was done in five sections. Work was begun in the spring of 1891. The progress was slow, the rock being very hard. Red, green and gray sandstone, conglomerate, fine grain, large pebble and black sandstone were met during the boring. Ingersoll-Sargent rock drills were used and the blasting was done with forcite, a refined form of dynamite, less powerful, but giving out but little fumes and smoke. Of this 350 lbs. were used. As originally planned the tunnel was 8 ft. x 8 ft., but this was afterward changed to 7 ft. x 9 ft. Many streams of water were met with which was pumped from the different sections. The bore hole from the flooded workings was cut with a jump drill and rope. For 250 ft. a 12-in. hole was worked. Then the bore was changed to 6 in. for 170 ft. and from here to the tunnel, 20 ft., was reduced to 4 in. Iron pipes surrounding the drill keep the water out of the tunnel. The 4-in. hole is now stopped with a hickory plug. When the iron casing and plug are removed, about 8,000 gallons per minute will empty into the tunnel. About two months will suffice to empty the 500,000,000 gallons now in the workings. Not a man was killed during the progress of the work, and only four were injured.

#### Coal on Illinois Central Engines in Chicago.

Owing to the suit threatened by the city of Chicago against the Illinois Central Railroad, if the latter did not abate the nuisance due to the smoke of its engines running along the lake front, steps were taken to improve the quality of the coal used. New River coal was tried for a while, but was discontinued. Southern Illinois coal is now used on train engines. It is carefully selected and screened, and much improvement has resulted. The two yard engines making up trains in the Central Station at Twelfth street use coke and anthracite; a 72-hour coke is burned in one and anthracite coal in the other. If the coke fulfills all requirements it will be used in the other engine, as it costs less than anthracite.

#### The Trent Valley Canal.

Andrew Onderdonk, of Chicago, has signed the contract with the Dominion Government for the construction of the Balsam Lake and Lake Simcoe division of the Trent Valley Canal, the cost of which is estimated at \$200,000.

The Dominion Government is calling for tenders for the construction of the Peterboro and Lakefield division of the Trent Valley Canal. The tenders will have to be in by March 25. R. B. Rogers is the engineer in charge.

#### THE SCRAP HEAP.

##### The Proposed Bridge at Montreal.

The Montreal Bridge Company is making preparations for the construction of the new bridge across the St. Lawrence river. As stated before in the *Railroad Gazette*, the company invites engineers and bridge builders to send in their plans and estimates for the steel superstructure of the bridge. The structure is to cross the St. Lawrence river from a point near Dalhousie Square Station (East End Depot), Montreal, to Isle Ronde, and thence to the southern shore. Its length is to be about two miles, divided as follows: One cantilever span of 1,250 ft., two side spans of 500 ft. each, 15 viaduct spans on the south side of 250 ft. each, and 18 viaduct spans on the Montreal side of 250 ft. each. The height of the carriage road on the large cantilever span above the water level will be about 150 ft., a higher altitude than the great Brooklyn Bridge. The bridge will be so constructed as to allow a double line of railroad track, a double track for electric tramways, two roadways for carriage vehicles, and footpaths for passenger traffic. The cost of the structure will be about \$6,000,000, besides the terminal facilities, which will increase it by about \$200,000. It is expected that all the railroads con-

verging at Montreal will make use of the bridge. Thus, as will be seen, it will be second in size only to the great Victoria Bridge, while its importance will be even greater. It is proposed, in connection with the Atlantic & Lake Superior Railroad, a project which is now creating much discussion in Canada and London. Senator Thibaudau and Mr. C. N. Armstrong have left for London proposing to conclude the necessary financial arrangements. Prizes of \$1,000 and \$500 are offered for the best two plans for the bridge. The roadways are to be on the same level as the cantilever spans, but on the approach viaducts the four-rail tracks are to be above and the wagon-road and footwalks below, and so adjusted as to give an easy grade from the level of the cantilever deck to that of the lower chords of the trusses.

Plans will be received up to May 15 addressed to the Secretary of the Montreal Bridge Company, 17 St. James street, Montreal. The Chief Engineer is Mr. W. Shanley, of Montreal.

#### A Steamboat's Record.

Out in the State of Washington there is a steamboat which lets no grass grow under her feet (if the Hibernian editor may be allowed a figure of speech). It is the "Flyer," a screw steamboat, 200 ft. long, carrying passengers on Puget Sound. She ran 68,695 miles during the year 1894, which is believed to be one of the best records ever made by a boat of that kind. This vessel, which belongs to the Puget Sound & Columbia River Transportation Company, makes four round trips daily between Seattle and Tacoma, 27½ miles, or 220 miles a day. The round trip of 55 miles is made in three hours. The distance between these two cities by rail is about 40 miles, but the "Flyer" makes such good time and is so punctual that she is said to be more popular than the railroad trains. The aggregate of lost time during the year is said to have been only 43 minutes. It will be observed that the distance traversed daily is greater than that made by the boats on either Long Island Sound or the Hudson River.

#### To Examine the Panama Canal.

M. de La Tournier, chief engineer of the New Panama Canal Company, and M. Waldemann, have arrived at Colon from France to examine into the condition of the canal. The affairs of the canal remain in the dormant state that has prevailed for sometime.

#### American Steel Barge Co.

The American Steel Barge Co. of West Superior, Wis., held its annual meeting in New York last week and the Rockefeller interest was able to secure control. Colgate Hoyt was elected President and Treasurer, and F. Rockefeller, brother of John D. Rockefeller, was made Vice-President. R. C. Wetmore was re-elected Secretary. The directors are Colgate Hoyt, James C. Colgate, Charles L. Colby, ex-president of the Wisconsin Central; Henry C. Rouse, receiver of the Northern Pacific; Samuel Nather, Frank Rockefeller, Alex. McDougal, the inventor of the whaleback; A. D. Thompson, and Thomas Wilson. The election is supposed to be another step toward the consolidation of the interests now known as the Duluth, Missabe & Northern Railroad, Mesaba Iron Mines, West Superior Iron & Steel Co., and American Steel Barge Co.

#### Ticket Scalping Illegal in North Carolina.

The Legislature of North Carolina four years ago passed a law making the business of railroad ticket scalping unlawful in that State. Two years later, however, the law was repealed, and for the last two years considerable business has been done by scalpers in Raleigh, Asheville, Charlotte, Wilmington and Greensboro. During the present session of the Legislature the Atlantic Coast Line and the Southern Railway, two of the three principal railroad systems operating in North Carolina, joined in an effort to have a new law enacted which would drive the ticket scalpers out of business in that State. Their efforts have at last been successful, the Legislature having just passed such a bill. The new law makes it a misdemeanor for any person to sell or deal in tickets used by any railroad company, unless such person is a duly authorized agent of the railroad company whose tickets he handles. All such agents are required to exhibit their authority to sell or deal in tickets, and the railroad company is made responsible for their acts. Another provision of the bill is to the effect that when any round-trip ticket is sold, the company issuing it shall redeem the unused portion of it by allowing the legal holder the difference between the cost thereof and the price of a one-way ticket between the stations for which the round-trip ticket was sold, tickets to be presented within 60 days after maturity.

#### Canal Notes.

The American Manufacturer reports that the guarantee fund for the survey for the Lake Erie & Ohio River Ship Canal has now reached \$27,650 and surveys will soon be commenced. This is the projected canal between Conneaut Harbor, on Lake Erie, via the Shenango and Beaver rivers, into a pool made by the Davis Island dam below Pittsburgh. The projected canal and slack-water navigation will be 130 miles long, with 51 locks, 45 x 300 ft. in plan with 15 ft. of water on their miter sills. An estimate of the cost, based on a very hasty survey, was made by Thos. P. Roberts and the late John Goodwin as \$30,000,000. In view of the intention to build steamers for lake traffic 420 long and probably drawing 18 or more feet of water, it will be seen that the proposed locks are entirely too small for the lake marine, and the first estimate will probably be enlarged.

Resolutions have been introduced both in the Senate and House of Representatives providing for the appointment of a commission of five members by the Secretary of War, two at least of whom shall be citizens of Indiana and one at least an engineer officer of the army, to make a thorough examination and report upon a ship canal to connect the south end of Lake Michigan with the Wabash river. It is possible to follow the route of Colonel Gillispie's survey, of 1875, to Michigan City, but it is more probable that a route to the Calumet in South Chicago will be adopted. The Kankakee presents the possibility of a route that would join the extension of Mr. Cooley's big ditch, either at the junction with the Des Plaines, or possibly higher up. This last route might be the one of greatest local value, though not as direct as that to South Chicago.

#### CAR BUILDING.

The Ensign Manufacturing Company has received an order for 700 ventilated fruit and 60 refrigerator cars from the Southern Pacific.

The Concord & Montreal is in the market for one combination car, three passenger coaches and one parlor car to make up a train to be called the White Mountain train.

The Duluth & Iron Range order for 400 cars was divided between the Pullman Palace Car Co. and the

Duluth Manufacturing Co., of Duluth, Minn., the Pullman Company being awarded 300 cars and the Duluth Company 100 cars.

The contract for the Boston & Maine Railroad freight cars, referred to in this column on Feb. 8, will probably not be let for several weeks. Specifications have not yet been given out. The order will probably call for 200 coal cars, 200 platform cars, and 200 box cars.

The 500 ventilated box cars being built for the Southern Railway are all to have the Hutchins patent car roof. The Ohio Falls Car Co. is building 350 of these cars and the remaining 150 are being built at Gadsden, Ala., by the Elliott Car Co.

The Pullman Car Co. has received an order from the Southern Pacific for 18 passenger coaches and also for 500 box cars.

The Union Car Works at Depew, N. Y., are very busy, employing a full force in all departments with orders for 500 cars for immediate delivery. An addition to erecting shop No. 1, 126 x 360 ft., is to be built, and this will give this building a total length of 700 ft. There will then be room under cover for over 150 cars.

The Hutchins Refrigerator Car Co. has ordered from the Wells & French Co. 200 standard refrigerator cars for the California Fruit Transit Co. These cars are to be equipped with the Westinghouse air brake, California couplers, steel bolsters, made by the American Steel Foundry Co., of St. Louis, Miner's improved draw bar, and are to have the Hutchins car roof.

The Pennsylvania is now preparing plans for 1,000 gondola cars, and the awards for building these cars will be given out before long. They will be assigned to the lines west of Pittsburgh. The report that the Pennsylvania has contracted for 1,000 cars to be built at the Ohio Falls Car Works is untrue.

The Southern Pacific is building six new express and baggage cars at its New Orleans shops. These cars are to be of the latest design, and will be lighted by Pintsch gas.

The New York Central & Hudson River Railroad will give out contracts within a few days for a large number of freight cars. The bids are all in, but the contract has not yet been awarded, nor is the number to be built definitely decided upon, although it will probably be 3,000, or very near that number. It is likely that a large part of the order will go to the Michigan-Penninsular Car Co., and the remaining portion to the Union Car Works of Depew. The cars are to be box cars, of 60,000 lbs. capacity, and will be run as "Grain Line Transit" cars. They are to be built in accordance with the standard specifications of the New York Central Railroad, and will have Gould car couplers, the Fox trucks, Westinghouse brakes, McGuire grain doors, Vose springs, turn buckles made by the Cleveland City Forge Company, and the New York Central draft gear.

#### BRIDGE BUILDING.

**Belleville, Ont.**—Tenders will be received by Mr. William R. Aylesworth, City Clerk, for the substructure and superstructure, separately, for a county bridge in Hastings, about eight miles north of Belleville. The superstructure will be in three spans, middle span 148 ft. and each end span 100 ft. long, with 16 ft. roadway in the clear.

**Toronto, Ont.**—The Parks and Gardens Committee have decided to call for tenders for the erection of a steel bridge across the lagoon at Island Park.

**Ottawa, Ont.**—The county council is calling for tenders for the construction of a bridge across the Rideau river to replace the old Hurdman Bridge. Tenders for a wooden bridge and a bridge partly iron and partly wood are asked for.

Another effort is being made to induce the Dominion, Quebec and Ontario Governments to grant a subsidy to the Interprovincial Bridge at Ottawa, towards the construction of which the city of Ottawa has voted a bonus of \$150,000.

**Castleton, Ont.**—It has been decided to rebuild the iron bridge at Castleton, which was swept away by freshet last spring.

**Winnipeg.**—It is estimated that the proposed reconstruction of the Osborne street bridge will cost \$9,500.

**Sibley County, Minn.**—A bill to appropriate \$1,500 for building a bridge across Buffalo Creek, in Sibley County, has been introduced in the Minnesota Legislature.

**Stearns County, Minn.**—An appropriation of \$4,000 out of the internal improvement fund for a wagon bridge across the Mississippi, in Stearns County, is before the Minnesota Legislature.

**Elk River, Minn.**—A bill to appropriate \$5,000 for building a bridge across the Mississippi at Elk River is before the Minnesota Legislature.

**Melville, La.**—The Texas & Pacific Railway Company has just completed a 250-ft. iron span on the east bank of the Atchafalaya river.

**Buffalo, N. Y.**—The Governor has signed Mr. Gerst's bill appropriating \$9,500 for a canal bridge at Mill street, Buffalo.

**Rochester, N. Y.**—The Superintendent of Public Works last week opened the bids for the Emerson street bridge over the Erie canal at Rochester. There was only one bid for the iron superstructure of the bridge. It was from the Wrought Iron Bridge Co., of Canton, Ohio, and the contract was awarded to this firm. For building the substructure of the bridge there were six bidders, as follows: B. P. Smith, Rochester, \$3,753; Chambers & Casey, Rochester, \$4,331; John Calnan, Rochester, \$4,415; Brayer & Albaugh, Rochester, \$6,707; Lauer & Hagaman, Rochester, \$7,614; Pidgeon & Co., Albany, \$8,259.

**Bangor, Me.**—A steel bridge is to be built across the river at Bangor, from the Webster Paper Mill to the site of the new pulp mill in Orono, and the piers for the bridge are being built on the ice and then sunk.

#### MEETINGS AND ANNOUNCEMENTS.

##### Dividends.

Dividends on the capital stocks of railroad companies have been declared as follows:

**Boston & Maine**, \$3 per share on the preferred stock, payable March 1.

##### Stockholders' Meetings.

Meetings of the stockholders of railroad companies will be held as follows:

**Atlanta & Charlotte Air Line**, New York City, March 13.

**Camden & Atlantic**, annual, Camden, N. J., Feb. 28.

**Gulf, Colorado & Santa Fe**, annual, Galveston, Tex., March 5.

**Missouri Pacific**, annual, St. Louis, Mo., March 12.



*Northern Central*, annual, Baltimore, Md., Feb. 28.  
*Pennsylvania*, annual, Philadelphia, Pa., March 12.  
*Philadelphia, Marlton & Medford*, annual, Camden, N. J., Feb. 28.  
*St. Louis, Iron Mountain & Southern*, annual, St. Louis, Mo., March 12.  
*Sterling Iron & Railway Co.*, annual, Astor House, New York City, March 5.  
*Texas & Pacific*, annual, New York City, March 20.  
*Wabash*, annual, St. Louis, Mo., March 12.

#### Technical Meetings.

Meetings and conventions of railroad associations and technical societies will be held as follows:

The *Freight Claim Association* will hold its annual meeting in Chicago on March 13. The headquarters will be at the Auditorium. The Secretary is S. A. Mehorter, of Philadelphia.

The *Car Accountants' Association* will hold its next meeting at the Palace Hotel, San Francisco, Cal., on April 16, 17, 18 and 19.

The *Association of Railroad Air-Brake Men* will hold its next annual meeting in St. Louis, Mo., from April 9 to 11. The headquarters will be at the Lindell Hotel.

The *Western Railway Club* meets in Chicago on the third Tuesday of each month, at 2 p. m.

The *New York Railroad Club* meets at the rooms of the American Society of Mechanical Engineers, 12 West Thirty-first street, New York City, on the third Thursday in each month, at 8 p. m.

The *New England Railroad Club* meets at Wesleyan Hall, Bromfield street, Boston, Mass., on the second Wednesday of each month.

The *Central Railway Club* meets at the Hotel Iroquois, Buffalo, N. Y., on the fourth Wednesday of January, March, April, September and October, at 10 a. m.

The *Southern and Southwestern Railway Club* meets at the Kimball House, Atlanta, Ga., on the third Thursday in January, April, August and November.

The *Northwestern Railroad Club* meets at the Ryan Hotel, St. Paul, on the second Tuesday of each month, at 8 p. m.

The *Northwestern Track and Bridge Association* meets at the St. Paul Union Station on the Friday following the second Wednesday of March, June, September and December, at 2.30 p. m.

The *American Society of Civil Engineers* meets at the House of the Society, 127 East Twenty-third street, New York, on the first and third Wednesdays in each month, at 8 p. m.

The *Western Society of Engineers* meets on the first Wednesday in each month, at 8 p. m. The headquarters of the society are at 1736-1739 Monadnock Block, Chicago.

The *Engineers' Club of Philadelphia* meets at the House of the Club, 1122 Girard street, Philadelphia, on the first and third Saturdays of each month, at 8 p. m.

The *Boston Society of Civil Engineers* meets at Wesleyan Hall, 36 Bromfield street, Boston, on the third Wednesday in each month, at 7.30 p. m.

The *Engineers' Club of St. Louis* meets in the Missouri Historical Society Building, corner Sixteenth street and Lucas place, St. Louis, on the first and third Wednesdays in each month.

The *Engineering Association of the South* meets on the second Thursday in each month, at 8 p. m. The Association headquarters are at The Cumberland Publishing House, Nashville, Tenn.

The *Engineers' Society of Western Pennsylvania* meets in the Carnegie Library Building, Allegheny, Pa., on the third Tuesday in each month, at 7.30 p. m.

The *Technical Society of the Pacific Coast* meets at its rooms in the Academy of Sciences Building, 819 Market street, San Francisco, Cal., on the first Friday in each month, at 8 p. m.

The *Association of Engineers of Virginia* holds informal meetings on the third Wednesday of each month, from September to May, inclusive, at 710 Terry Building, Roanoke, at 8 p. m.

The *Denver Society of Civil Engineers* meets at 36 Jacobson Block, Denver, Col., on the second and fourth Tuesdays of each month except during July, August and December, when they are held on the second Tuesday only.

The *Montana Society of Civil Engineers* meets at Helena, Mont., on the third Saturday in each month, at 7.30 p. m.

The *Engineers' Club of Minneapolis* meets in the Public Library Building, Minneapolis, Minn., on the first Thursday in each month.

The *Canadian Society of Civil Engineers* meets at its rooms, 112 Mansfield street, Montreal, P. Q., every alternate Thursday, at 8 p. m.

The *Civil Engineers' Club of Cleveland* meets in the Case Library Building, Cleveland, O., on the second Tuesday in each month, at 8 p. m. Semi-monthly meetings are held on the fourth Tuesday of each month.

The *Engineers' Club of Cincinnati* meets at the rooms of the Literary Club, No. 24 West Fourth street, Cincinnati, O., on the third Thursday in each month, at 7.30 p. m. Address P. O. Box 333.

The *Engineers' and Architects' Club of Louisville* meets in the Norton Building, Fourth avenue and Jefferson street, on the second Thursday in each month at 8 p. m.

The *Foundrymen's Association* meets at the Manufacturers' Club, Philadelphia, Pa., on the first Wednesday in each month.

The *Western Foundrymen's Association* meets in Room 701, Western Union Building, Chicago, on the third Wednesday of each month. B. W. Gardner, Monadnock Block, Chicago, is secretary of the association.

The *Association of Civil Engineers of Cornell University* meets on Friday of each week at 2.30 p. m., from October to May, inclusive, at their association rooms in Lincoln Hall, Ithaca, N. Y.

#### American Society of Civil Engineers.

A regular meeting was held at the house of the Society Feb. 13, at which two papers were presented.

EFFECTS OF FROST AND THE SULPHATE OF SODA EFFLORESCENCE TEST.—BY LEA MCL. LUQUER.

In the writer's experiments all chemical questions are left unconsidered, and the physical action only observed. The samples subjected to two methods of testing were always adjoining pieces of the same stone, and the shattering effects of hammering were avoided. Samples were made of approximately the same size, all sharp edges or loose particles were removed, and finally the surfaces brushed over with a stiff brush. They were then dried in an air bath at 120 degrees C., and weighed on a chemical balance.

Previous experiments by others have proved that hot solutions will destroy stones which will resist the action of frost and cold saturated solutions. In the present experiments, after the preparation and weighing mentioned, the specimens were boiled in the sulphate of soda solution for half an hour, to obtain complete saturation, after which the solution was poured off, and the specimens washed. They were then again immersed for sev-

eral hours in a fresh solution, and afterwards suspended by threads in a dark room for 12 hours.

The next day they were soaked during the day, and hung during the night, this operation being performed eight times with each. In two cases the experiments lasted 10 days. All the specimens were then sprayed, to remove adhering particles, dried as before, and weighed.

In the freezing tests the specimens were allowed to thaw and soak during the day, and were hung up and frozen during the night. The temperature of the cold room was from 4 deg. to 10 deg. Fahr., and that of the warm room about 85 deg. Fahr.

The results obtained show very decidedly the greater effects to be from the soda solution. The effect of the solution was greatest on pure limestone, while that of frost was most marked on coarse-grained dolomite. The effects of both methods on sandstones were least on the fine grained, while all were much more affected than either limestones or granites. A specimen of pressed brick was more acted upon by both methods than either limestones or granites.

#### STATIC FRICTION, BY C. M. BROOMALL.

By static friction is here meant the resistance one body offers to the motion of another sliding upon it just at the instant of starting and is much greater than the friction of motion; and the coefficient is the ratio this bears to the normal pressure. The writer has made a series of experiments upon various surfaces, more particularly to determine the power required in the movement of head-gates. The apparatus used was so arranged as to allow considerable variations of pressure; 20 or 30 trials were made under each load, and the average of all readings was taken.

The writer draws a series of conclusions as follows: First.—The coefficient of static friction is nearly constant under varying pressures, and is practically independent of the area of contact.

Second.—Average coefficients of static friction are:

	Dry.	Wet.
Cast iron on cast iron	.3114	.3401
Pine on pine	.4738	.6350
Cast iron on pine	.4702	.....
Steel on steel	.4408	.....
" tin	.3648	.....
" cast iron	.2303	.....
Cast iron on tin	.4541	.....

Third.—Under the same pressure per square inch, the static coefficient decreased as the area of contact increased.

Fourth.—For cast iron on cast iron, the coefficient decreased as the pressure per square inch increased.

Fifth.—For dry pine on dry pine, the coefficient increased as the pressure per square inch increased. In no other case was this true.

Sixth.—Cast iron on pine gave slow decrease in coefficient, with increase of pressure.

Seventh.—Steel on steel gave marked decrease, with increase of pressure.

Eighth.—Steel on tin gave decrease, with increase of pressure.

Ninth.—Steel on cast iron, very marked decrease, with increase of pressure.

Tenth.—Cast iron on tin gave decrease, with increase of pressure.

Eleventh.—Continuance of pressure for a length of time gave but slight increase in the coefficient, in the case of dry pine on pine, cast iron on tin, or cast iron on pine. With wet pine on pine and all the other combinations the increase was marked.

Twelfth.—Discusses the curves obtained by plotting the results; showing a tendency to uniformity after certain pressures reached.

Thirteenth.—Mentions a preliminary "slip" of  $\frac{1}{8}$  to  $\frac{1}{4}$  in. in the case of cast iron on cast iron, or steel on cast iron (especially under high pressures), with an increase in the power required to produce motion.

Fourteenth.—Notes that the effect of wetting the surface of cast iron on cast iron, or pine on pine, is to increase greatly the coefficient.

#### American Society of Mechanical Engineers.

On the evening of Feb. 13 the society held one of its informal monthly meetings at its house, 12 West Thirty-first street, New York City. A paper on electrical power in machine shops, illustrated by lantern slides, was read by Mr. George Richmond. Several of those present took part in the discussion which followed, and some valuable points were brought up, especially regarding the use of motors of low horse power and efficiency upon each machine, as compared to those of higher horse power and efficiency, surrounded by and driving several machines.

#### Railroad Air-Brake Men.

The next meeting of the Association of Railroad Air-Brake Men is announced for April 9 to 11, at St. Louis, with headquarters at the Lindell Hotel Convention Hall. Rooms can be secured by applying to F. M. Nellis, Chairman of the Committee on Arrangements. Mr. Nellis' address is care of the Secretary of the Association, at Pine Bluff, Ark.

#### PERSONAL.

—Mr. R. B. Cable has resigned as General Manager of the Florida Southern road.

—The Chicago office of Mr. George S. Morison has been removed from 184 La Salle street to room 1742 Monadnock Block.

—Mr. C. S. Adams has been appointed Receiver of the Jacksonville, Mayport & Pablo road, in Florida, in place of Mr. John L. Marvin.

—Mr. Henry Terrell has been appointed Receiver of the San Antonio & Gulf Shore road, being constructed from San Antonio to Velasco, Texas.

—Mr. J. T. Prince has resigned his position as General Superintendent of the Pontiac & Pacific Junction Railroad and Ottawa & Gatineau Valley Railroad.

—Mr. G. S. Reid has been appointed General Freight & Passenger Agent of the Texas Midland, vice Mr. J. E. Leith, resigned to engage in private business.

—Mr. E. J. Pearson has been appointed Superintendent of the Yellowstone & Missouri River divisions of the Northern Pacific, to succeed the late John Dorsey.

—Mr. Charles C. Gentry, of Rock Island, Ill., has been appointed Assistant Superintendent of the Hoosac Tunnel & Wilmington Railroad, with office at Readsboro, Vt.

—Mr. D. L. Barnes, associate editor of the *Railroad Gazette* and Consulting Engineer, has removed his Chicago office from the Rookery to Suite No. 1750 Monadnock Block.

—Mr. C. J. Stedwell, formerly Superintendent of the Cleveland division of the Big Four, has been appointed Superintendent of one of the Dakota divisions of the Chicago & Northwestern.

—Mr. N. W. Naylor, Chief Clerk in the Freight Department of the Terre Haute & Indianapolis Railroad, has been appointed General Freight Agent of this company (the Vandalia Line) with office at St. Louis.

—Mr. Charles C. Schneider, Chief Engineer of the Pen-coyd Bridge and Construction Co., delivered an address at the College of Civil Engineering, at Cornell University, on Feb. 15. The subject was "Details of Construction," and the address was illustrated by stereoscopic views.

—Mr. Percy R. Pine, vice-president of the Delaware, Lackawanna & Western Railroad Company, died last week at Rome, Italy, at an advanced age. He was a Director in numerous financial institutions, Vice-President of the Lackawanna Iron and Steel Company, and other corporations.

—Ex-Governor James Hogg, of Texas, has been appointed general solicitor of the Trinity, Cameron & Western and Georgetown & Granger railroads in that state. Only about 10 miles of railroad is actually built, though the project calls for the building of a line nearly 200 miles in length.

—Senator Manderson, of Nebraska, whose term expires in March, has accepted the office of attorney-general of the Burlington Railroad in Nebraska. He succeeds the late I. M. Marquette, of Lincoln, and will begin his duties about the middle of March, with headquarters at Omaha.

—The Governor of Alabama has nominated Capt. Harvey E. Jones, of Mobile, the present private secretary to the Governor, as Railroad Commissioner of Alabama, and the Senate has confirmed the nomination. The re-nomination of Mr. W. T. Tunstall, a member of the present commission, failed of confirmation.

—Mr. Bradford Dunham, Superintendent of the Alabama Midland Railroad, has been appointed General Superintendent of the Plant railroads. He was conductor on the Savannah, Florida & Western Railroad just after the war, and was connected with the Baltimore & Ohio Railroad as General Superintendent at one time.

—Mr. P. W. Resseman, General Yardmaster for the Buffalo Creek since May 20, 1893, has been appointed Superintendent of the Ottawa & Gatineau Valley and the Pontiac Pacific Junction with headquarters at Ottawa, Ont. He was formerly employed as General Yardmaster for the West Shore and the Fitchburg at Rotterdam Junction, N. Y.

—Mr. J. F. Richardson, who died at his home near Indianapolis last week, was the first Roadmaster of the road between Cincinnati and Indianapolis, now part of the "Big Four." Later he was promoted to be its General Superintendent and held that position until 1871. He then became a railroad contractor and built many miles of road in Indiana.

—Mr. Henry Fox, who has been Assistant Superintendent of the Iowa division of the Chicago, Rock Island & Pacific for some time, has been appointed Superintendent of the Kansas and Nebraska division of that road, with headquarters at Harrington, Kan. Charles Jones, formerly Chief Dispatcher in the Des Moines office, succeeds Mr. Fox as Assistant Superintendent at Des Moines.

—Mr. J. G. Egan, who for the past six years has been assistant general solicitor of the Atchison, Topeka & Santa Fe at Chicago, has offered his resignation, to take effect March 1. He will be succeeded by Mr. Robert Dunlap, of Topeka, who has been assistant solicitor of the Santa Fe for the State of Kansas. Mr. Egan resigns his position to engage in private law practice in Chicago.

—Mr. Robert G. Fleming, General Superintendent of the Savannah, Florida & Western, was stricken with paralysis on Feb. 12 at Savannah, Ga. One side of his body is paralyzed. The doctors give up all hope of his recovery, and state that he cannot possibly live more than a few days. Captain Fleming has been General Superintendent of the Savannah, Florida & Western since 1881.

—Mr. Charles O. Haines has been appointed Superintendent and Chief Engineer of the Atlantic & Danville Railroad in Virginia, an office which has just been created. Mr. Haines was, until recently, with the Jacksonville, St. Augustine & Indian River Railroad, and was in charge of the construction of the extension of that line for more than 125 miles south of St. Augustine, Fla., during 1893 and 1894.

—Mr. John Dorsey, Superintendent of the Missouri and Yellowstone divisions of the Northern Pacific Railroad, died at Glendive, Mont., on Feb. 8. Mr. Dorsey has been in the employ of the Northern Pacific for 25 years, beginning as a track laborer. He was Assistant Superintendent of the Fergus Falls division, and also held the same position on the Rocky Mountain division before he was made Superintendent of the Yellowstone division.

—Mr. C. A. Hammond, Secretary of the American Society of Railroad Superintendents, is now the editor of the monthly publication known as *Transportation*, published in New York City. This magazine has hitherto been devoted largely to monographs on special railroad subjects of a semi-technical character, but we understand that Mr. Hammond is to take up the discussion of all subjects of interest to railroad superintendents.

—Mr. H. M. Bell, Superintendent of the Chicago, Milwaukee & St. Paul's Lake Superior Division, has tendered his resignation, and Mr. R. R. Minturn, who has been Superintendent of the Wisconsin Valley Division for several years, will succeed him. J. H. Foster is to be transferred from the superintendency of the Hastings & Dakota Division to the Wisconsin Valley, to succeed Mr. Minturn, and the territory and jurisdiction of Superintendent J. R. Williams will be extended so as to cover the Hastings & Dakota Division.

—Mr. F. B. Pelham, an assistant civil engineer of the Michigan Central Railroad, died in Detroit, Mich., last week, aged 30 years. Mr. Pelham was, so far as we know, the only civil engineer of negro blood in the railroad service in this country. He was graduated in 1887 at the head of his class in engineering at Ann Arbor University. He was at once appointed a civil engineer on the Michigan Central road by Mr. Hawks, lately Chief Engineer of the company, who valued him as a most efficient engineer, and gave him charge of much important work. Mr. Pelham drew the plans for nearly 20 bridges on the Michigan Central, one the skew arch bridge at Dexter. He was a member of the Michigan Engineering Society.

—Mr. J. S. Morris, Superintendent of the Toledo Division of the Pittsburgh, Fort Wayne & Chicago Railroad, died at Toledo on Feb. 18, after several years of lingering illness. Mr. Morris' health began to fail about two years ago, but he continued to attend to his



duties of Superintendent until several months ago. He was 67 years old and began railroad life in Pittsburgh in 1857 on the Fort Wayne road. From a position as freight brakeman he successively became passenger conductor, yard and train dispatcher and Superintendent's secretary. During four years he was freight and ticket agent at Mansfield. In 1873 he was made Superintendent of the Toledo Division. Mr. Morris was widely known and popular among railroad men, loyal to the interests of his company, and an energetic and efficient officer. His only son was until recently Engineer of Maintenance of Way on the Toledo Division.

—The many railroad friends of Mr. A. A. Jackson, lately General Superintendent of the New York & New England Railroad, will learn with regret that he is lying seriously ill at his home in Norwood, Mass., near Boston. He has been suffering from heart trouble for a number of months, and his condition is now thought to be critical. Mr. Jackson went to the New York & New England in 1887 as Assistant to the President, and afterward became General Superintendent, holding that position until November, 1890. He was for more than ten years, from 1875, the Superintendent of the so-called low grade division of the Allegheny Valley Railroad, and the fine record which he made by his management of that property brought him into prominence as a railroad manager. He is a veteran in railroad service, and has been employed in nearly every department of railroading during nearly forty years of railroad service.

—Mr. Loren Packard, the Master Car Builder of the New York Central at its West Albany shops, died at Albany on Friday the 15th inst. after an illness of about seven weeks. Mr. Packard became Division Master Car Builder of the New York Central 11 years ago, going to that road from the Baltimore & Ohio, where he had been Master Car Builder at Baltimore. He had also been Master Car Builder of the New York, New Haven & Hartford Railroad, his services on these three railroads as Master Car Builder extending altogether over a period of almost 20 years. Mr. Packard was born in Northumberland, N. H., and was 52 years old. He served four years in the civil war, leaving school to enlist in a Vermont regiment. After the war he was employed in the works of the Wason Car Manufacturing Co., near Springfield, Mass. He was with that company 11 years, and was foreman of the shops for much of this period. In 1876 he went to the New York, New Haven & Hartford as car builder, and since that date has been continuously in railroad service. He had been a member of the Master Car Builders' Association since 1881.

—Mr. Eugene Lacelles Maxwell, of the important firm of Manning, Maxwell & Moore, of New York, died suddenly from a stroke of apoplexy at his home in Brooklyn, on Sunday of last week. Mr. Maxwell was in his forty-second year, and had been in the machinists' supply business for nearly twenty years. He was at first associated with H. S. Manning & Co., but for the last 14 years the firm had been Manning, Maxwell & Moore. This firm has long represented many of the leading manufacturers of machine tools, and Mr. Maxwell was an officer in many such corporations. He was President of the Pond Machine Tool Co., of Plainfield, N. J.; President of the Ashcroft Manufacturing Co., of Bridgeport, Conn.; Vice-President of the Shaw Electric Crane Co., of Muskegon, Mich.; and officer or director in five or six other concerns. Mr. Maxwell was a member of the Montauk Club, a leading club of Brooklyn, of which his associate, Mr. Charles A. Moore, is President; a member of the Engineers' Club, of New York, and of many other clubs in both cities. In Brooklyn, where he had been an active citizen, his death brought out universal expressions of esteem, the leading paper of the city referring to him as a man "so useful, so helpful and so exemplary that his loss is an impoverishment of a great number to whom his career and character were inspiring." One brother, Mr. J. Rogers Maxwell, is President of the Central Railroad of New Jersey, and another is a member of the banking firm of Maxwell & Graves, of New York.

#### ELECTIONS AND APPOINTMENTS.

**Atlantic & Danville.**—The office of Superintendent and Chief Engineer has been created, and Charles O. Haines appointed to the office. He will, under the direction of the General Manager, have charge of all matters pertaining to construction, maintenance of way and structure, as well as the movement of traffic. The Engineer of Maintenance of Way, Train Despatchers, Agents, and Yard Masters will report to and receive instructions from the Superintendent and Chief Engineer.

**Belington & Little Laurel.**—The annual meeting was held at Philippi, W. Va., on Thursday last, when the following were elected Directors: W. L. Watrous, F. M. Stephens, W. E. Johnson, M. Quigley, F. P. Reese, F. R. Warner, J. W. Howarth, Charles E. Terry, Charles Brandenburg, and A. J. Van Tuyle. The Directors elected W. K. Watrous, President; F. P. Reese, General Manager, and F. M. Stephens, Treasurer.

**Chicago, Rock Island & Pacific.**—The following appointments have been made owing to the death of H. A. White, Division Superintendent at Trenton, Mo. W. J. Lawrence, who has been Superintendent of the Eastern Division West of the Missouri river, with headquarters at Horton, Kan., has been appointed to the position held by Mr. White, Superintendent of the Southwestern Division lines East of the Missouri river.

W. M. Hobbs, who has been Superintendent of the Southwestern Division West of the Missouri river, has been transferred to the position formerly held by Mr. Lawrence. H. Fox, formerly Assistant Superintendent of the Iowa division, with headquarters at Des Moines, has been transferred to the position held by Mr. Hobbs. C. W. Johns has been appointed to the position of Assistant Superintendent of the Iowa Division, vice Mr. Fox, promoted. T. C. Scott is appointed Trainmaster of the Eastern Section of the Iowa Division, in addition to his duties as Chief Dispatcher, vice C. W. Johns, promoted.

**Chicago & Erie.**—W. O. Johnson has been appointed General Counsel for the railroad, with office in the Rookery Building, Chicago. Mr. Johnson was connected with the road in the same capacity about 10 years ago, when it was known as the Chicago & Atlantic.

**Columbus Connecting & Terminal Co.**—This company, owning the extensive terminal property of the Norfolk & Western at Columbus, O., has elected the following directors for the ensuing year: J. I. Doren and J. J. Kimball, Philadelphia; J. Robinson and J. J. Archer, Columbus; J. W. Bannon, Portsmouth. This property is not included in the receivership of the Norfolk & Western.

**Lake Erie & Western.**—H. F. Bickwell, assistant trainmaster of the Pennsylvania at Pittsburgh, has been appointed division superintendent of the Lake Erie & Western, with headquarters at Lima, O.

**Lancaster, Cecil & Southern.**—The new directors are Walter M. Franklin, Jacob Long and J. W. B. Bauseman, of Lancaster City, Pa.; J. E. Ramsey, A. M. Nevin and J. M. Sholkwalter, of Oxford, Pa., and W. T. Warburton, of Elkton, Md.

**Missouri, Kansas & Texas.**—Third Vice-President Foster of the Missouri, Kansas & Texas, of Texas, announces the appointment of D. S. Willard, Auditor of the company, as Auditor of the lines in Texas, vice John C. Telfer, resigned.

**Philadelphia & Erie.**—The recently re-elected Board of Managers of the company have re-elected N. Parker Shortridge President and Joseph J. Vanzandt secretary and Treasurer.

**Terre Haute & Indianapolis.**—N. W. Taylor has been appointed general freight agent of this company, with office at St. Louis, to succeed the late Mr. H. W. Hibbard.

**Texas Central.**—The stockholders elected Henry K. McHarg, A. D. Morgan, Walton Ferguson, E. Rotan, B. R. Parrott, T. S. McLendon and Charles Hamilton directors at a meeting at Waco, Tex., on Feb. 11. The directors elected Henry K. McHarg, of Stanford, Conn., President; Charles Hamilton, Vice-President and General Manager; Richard Oliver, of Waco, Secretary and Treasurer, and D. C. Morgan, of New York, Assistant Secretary and Treasurer.

**Wheeling & Lake Erie.**—The stockholders of the company at Toledo have elected W. E. Connor a director in place of Arthur W. Soper. Frank R. Lawrence has been chosen President and John Greenough Vice-President.

#### RAILROAD CONSTRUCTION, Incorporations, Surveys, Etc.

**Atlantic & Lake Superior.**—The promoters of this railroad, among whom are Hon. Senators Thibadeau and Desjardins, Messrs. A. F. Gault, Dr. Bergin, M. P., and others, are reported to have recently completed financial arrangements for commencing work in the spring. The contract for the road between Longueuil and Lewis has been awarded to Messrs. Nicholas and Michael Armstrong, and an additional 20 miles, known as the Baie des Chaleurs section, will be put under contract early in March. The proposed bridge across the St. Lawrence is planned in connection with the undertaking.

**Batavia & Northern.**—A meeting of the State Board of Railroad Commissioners was held at Buffalo, N. Y., on Feb. 15, to consider the application made by the stockholders of the International & Oak Orchard Harbor and the Batavia & Northern railroad companies for a certificate that a railroad between Batavia and Oak Orchard, N. Y., on Lake Ontario, is a public necessity. The line of the proposed railroad begins at Oak Orchard Harbor, on Lake Ontario, in Orleans County, and extends through the village of Gaines, then to Fair Haven and to Albion, where it crosses the Niagara Falls branch of the New York Central, thence southerly passing through or near the village of Barre, Barre Center, and Elbe, where it crosses the West Shore Railroad, and thence to Batavia, a distance of 28 miles. At Batavia the road can connect with the New York Central, the Erie, or the Lehigh Valley. The promoters of the road expect to do a large business in transporting coal to Canadian consumers. The capital stock of the combined railroad companies is \$500,000. Robert Avery, of New York, is President of both companies.

**Bellaire, Zanesville & Cincinnati.**—The original plans for the extension of this line to the Ohio river, by way of Captina Creek, have been changed for the purpose of reaching a rich coal field, and to secure a direct coal line from the Ohio river to the Lakes by way of the Columbus, Sandusky & Hocking, which recently purchased a controlling interest in the Bellaire, Zanesville & Cincinnati. The original surveys called for a line from Zanesville to Senacaville, and thence along Captina Creek to Alledonia and to the Ohio river. About the time these plans were formulated the people interested in the Columbus, Sandusky & Hocking became interested in the Bellaire, Zanesville & Cincinnati, and bought the holdings of the bondholders in Ohio, securing control. Col. C. L. Mooney, President of the road, has, within the past three months, bought about 20,000 acres of coal land in Belmont and Monroe counties for the Columbus, Sandusky & Hocking, and the route will be changed to reach this field. It will begin at a point southeast of Zanesville, and following Captina Creek, will reach Alledonia by a more direct route, and thence will follow Captina Creek part way to Bellaire. The part of the Bellaire, Zanesville & Cincinnati road which will be used in the new line will be made standard gage, and the building of the connecting lines will be begun in the spring. The coal which has been taken up by President Mooney is the No. 8 Pittsburgh seam, and located about 75 ft. below the surface. Its quality was tested in an actual experiment in running trains on the Grand Trunk Railroad about six months ago.

**Charleston, Clendennin & Sutton.**—Work on this line has been almost suspended on account of the very severe weather of the past month. The contractors are still in the field with their men and will get to work in full force as soon as the weather will permit. The engineers who are working on that part of the line between Clendennin and Sutton, W. Va., along the Elk River Valley, have reached Frametown, Braxton County, and are making considerable headway, in spite of the weather. They are working in the direction of Sutton and expect to reach that point by the middle of March. As soon as the weather opens, a force of men will be put to work on the Sutton end of the line, and work will be prosecuted from both ends with all possible vigor. It is hoped to have the line opened through by September.

**Chateaugay & Northern.**—Messrs. Eugene Malo, John Chaffers and P. Poulin, of Montreal; A. F. Savaria, of Waterloo, Ont., and Dr. Cartier, of Ste. Madeleine, are applying for incorporation in Canada under this name, for the purpose of building and operating a line from Montreal to some point in Soulanges County, thence northeasterly across Montreal Island and continuing to some point on the Great Northern road in Joliette, County, Que. The company has a subscribed capital of \$200,000.

**Delta, New Westminster & Eastern.**—This company has been granted a charter to build a line from a point on the Gulf of Georgia to New Westminster, B. C., with a branch line from some point in Delta municipality, through Surrey, Langley and Matsqui, to some point near Abbotsford.

**Florence & Cripple Creek.**—It is stated that John C. Montgomery, of Denver, has secured an option for the sale of the property of this company at a price said to be \$2,000,000, and that a Boston syndicate will take the

property. This railroad was completed in July, 1894, and has paid dividends from the start. It is narrow gage, 40 miles long, and having a down grade from Cripple Creek to Florence, is able to give cheap transportation rates for the great amount of low-grade ores in that district.

**Indianapolis, Bloomington & Bedford.**—The stockholders of the company are keeping up their organization, and elected directors at a recent meeting. The road is to be from Indianapolis, Ind., southwest through the center of the oolitic limestone, more commonly known as the Bedford limestone field, to Bedford. The length of the line is 80 miles, and about 35 miles have been located. Subsidies amounting to \$132,000 have been voted, and are payable in cash. A large portion of the right-of-way has been procured. Newell Sanders, Benjamin Thompson, H. Clay Evans, Judson Buchanan, of Chattanooga, Tenn., and S. C. Dodds, of Bloomington, Ind., were recently elected directors; Newell Sanders is President of the company.

**Ironton, Bancroft & Ottawa.**—Engineers are now locating a line eastward from Bancroft, in the county of Hastings, Ont., so as to either build direct to Brockville or connect with other lines leading to the proposed bridge over the St. Lawrence River at Brockville.

**Leavenworth & Western.**—This company has filed articles of incorporation at Topeka, Kan., and proposes to build 75 miles of standard gage railroad, connecting Topeka and Leavenworth. The company is organized with a capital of \$100,000, and the directors are: E. W. Snyder, W. B. Nickels, J. H. Wendorf, E. A. Kelly and W. C. Hook, all of Leavenworth, Kan. The line is to extend through the counties of Leavenworth, Jefferson and Shawnee, and form a direct route between Topeka and Leavenworth.

**Lancaster, Cecil & Southern.**—President Walter Franklin, of Lancaster, Pa., met with the other directors at Elkton, Ind., last week to consider the completion of the road from Providence, Cecil County, to Oxford, Pa., and from Childs, on the Baltimore & Ohio Railroad, to Elkton, Md., the southern terminus of the road. It was agreed that steps should be taken to complete the road at an early date. When the road is completed from Elkton to Oxford it will then connect with the Lancaster, Oxford & Southern Railroad, which now extends to Peach Bottom, and from thence it will connect by way of Quarryville to Lancaster City, thus making a southern outlet to Elkton and intersecting the Philadelphia Division of the Baltimore & Ohio Railroad at Childs Station. The road, as it now stands, runs from Childs, on the Baltimore & Ohio, to Providence, along the Big Elk Creek, along which there are numerous mills.

**Metropolitan Elevated (Boston).**—A petition was received in the Massachusetts Legislature last week from J. H. Bickford for the incorporation of the Metropolitan Elevated Railway Company, with a capital of not less than \$15,000,000 nor more than \$25,000,000, the corporation to be authorized to construct and operate, by electricity or other power, an elevated railroad in the city of Boston and other cities and towns where the consent of the Mayor and Aldermen or Selectmen is obtained.

**Midland Terminal.**—The construction work upon the switchback at Victor, Col., and terminals in Cripple Creek, has been resumed.

**Minneapolis, St. Paul & Ashland.**—This company was incorporated in Wisconsin last week to construct a railroad from Minneapolis to Ashland, Wis., a distance of 200 miles. Its capital stock is \$2,500,000. The principal stockholders are: Thomas Bardon, J. W. Cochran, Col. John H. Knight and W. P. Bowron, of Ashland, Wis. C. H. Pratt, of Minneapolis, is Secretary. The route of the road was described in this column, page 61, Jan. 25.

**New Brunswick.**—Hugh P. Hazen, C. E., has surveyed two routes for the projected railroad from St. John to Barnesville; one from Coldbrook to Silver Falls, estimated at \$12,000 a mile, and one from Marsh bridge to Silver Falls, estimated cost \$17,000 a mile.

**Newark, N. J.**—The President has approved an act authorizing a bridge across Newark Bay, below Newark.

**Newcastle & Trucadee.**—Application has been made to the Dominion Government for a bonus to aid in the construction of a railroad from Newcastle to Trucadee, N. B. There will be a large amount of bridge work on the projected route.

**New Roads.**—T. L. Marquis has the contract for building six miles of line from the phosphate works of Comer, Hull & Co., at Arcadia, Fla., to that of the Peace River Co.

**Ottawa, Arnprior & Parry Sound.**—Contracts for the construction of the two ten-mile sections west of Long Lake, Ont., have been awarded to Wm. Farquhar, of Toronto, and O'Neil and Campbell respectively.

**Pittsburgh & Eastern.**—The company has decided to increase its capital stock from \$2,750,000 to \$5,000,000. The company is an independent corporation and contemplates building a road from a connection with the Beech Creek at Mehaffey, Pa., to Pittsburgh connections with the Baltimore & Ohio, passing through the undeveloped portions of Indiana, Westmoreland and Cambria counties. The main line and branches will aggregate 150 miles, and it is said construction work will begin as soon as spring opens. The surveys have all been made and are now undergoing revision.

**Pittsburgh & Lake Erie.**—It has been decided by the stockholders of the Monongahela division of the Pittsburgh & Lake Erie to extend the road from the present terminus, Belle Vernon, to Fayette City, Pa. Work on the extension will begin in the early spring.

**Plymouth County.**—A survey is now being made for a new steam railroad to run between East Weymouth and Marshfield, Mass., through a heretofore undeveloped part of Plymouth County. The railroad is not a new scheme, for three years ago a project to build a railroad through this same country was started, but got no further than a survey of the proposed route. Surveyors have already commenced work at the East Weymouth end and will carry the surveys forward to the easterly terminus at Marshfield. The road will connect with the Old Colony railroad at Reed's crossing East of the East Weymouth station. The proposed route will be from East Weymouth through South Hingham, Norwell, Scituate and Marshfield to the Brant Rock shore. The distance will be about 20 miles.

**Rumford Falls & Rangeley Lakes.**—The preliminary survey of this line, an extension of the Portland & Rumford Falls road, has just been completed by R. B. Straton, Chief Engineer. The location will be made next spring, after which the contracts will be let for grading and track laying. The work will be rather heavy, grades heavy, but the curves rather light. Two



iron bridges of 25 ft. and 30 ft. span will be built. The route of the extension is starting at the mouth of the Braden stream, and following up the east side of Braden stream, then crossing to the Bennis stream, and following down on the west side of Bennis stream to the Mooselookmeguntic lake, then crossing Bennis stream at its mouth and following along east shore of lake to Camp Bennis.

**St. Emille.**—This company is applying for incorporation for the purpose of constructing a line from St. Gabriel de Brandon to St. Michel des Saints, Que., passing through St. Damien, St. Come, St. Zenon, etc.

**Terminal Railroad Association of St. Louis.**—The elevated extension from the east into the new station will be completed and ready for use on March 1, after which date the Burlington and the Missouri, Kansas & Texas will have access by it to the Union Station, thus avoiding the tunnel.

**Tunnelton, Kingwood & Fairchance.**—President Martin states that the preparations for widening the gage from Tunnelton, on the Baltimore & Ohio railroad, to Kingwood, Preston County, W. Va., to standard, will begin as soon as the weather will permit. Half the ties needed have been delivered along the road, and the remainder are contracted for. The right of way has been cleared to the full width. The rails have been contracted for in Pittsburgh, and will be delivered during March. Concerning the extension of the road to Morgantown, by way of the "Black Bottle" route, mostly along the Cheat River Valley, Mr. Martin said it was not likely that this part of the work would begin this year. The route has been surveyed several times, and all these surveys are in existence. It is expected that nearly all the right of way will be given free.

**Victoria, Vancouver & Westminster.**—This company has been incorporated, with power to build a line from a point near Garry Point, on the Fraser River, through Richmond, South Vancouver and Burnaby to Westminster, B. C., with a branch to Vancouver.

**Vining & Coleman.**—The company filed its charter at Austin, Tex., on Feb. 11, with a capital stock of \$30,000. The incorporators are W. N. Cole, Jr., of New York; John D. Mitchell, W. R. Hamby, W. L. Vining, of Austin, and others. The proposed line starts in the town of Coleman and extends in a southerly direction 30 miles to the Colorado river, near the town of Waldrup, in McCulloch County, and reaches the Vining coal mines at that point. The project was described in this column some weeks ago.

#### GENERAL RAILROAD NEWS.

**Alabama Great Southern.**—The Alabama House has sustained the Governor's veto in what is known as the alien railroad bill by a vote of 53 to 31. This bill sought to prevent foreign stockholders from voting in stockholders' meeting in Alabama, and was intended to benefit the Southern Railroad Company in its contest with the Cincinnati, Hamilton & Dayton Railroad Company for the possession of the Alabama Great Southern, from Chattanooga, Tenn., to Meridian, Miss. The Governor stated that the bill was unconstitutional.

**Brooklyn Elevated.**—The company reports its earnings for the quarter ending Dec. 31 as follows:

	1894.	1893.	Inc. or Dec.
Gross earnings.....	\$431,222	\$447,475	D. \$16,253
Oper. expen.....	249,765	267,769	D. 18,004
Net earnings.....	\$181,457	\$179,706	I. \$1,751
Other income.....	1,038	1,269	D. 231
Total income.....	\$182,495	\$180,966	I. \$1,529
Fixed charges.....	210,025	203,003	I. 7,022
Deficiency.....	\$27,530	\$22,037	I. \$5,493

The balance sheet shows cash on hand, \$82,617, and a profit and loss deficiency of \$54,669.

**Charleston, Sumter & Northern.**—The railroad was sold at Sumter, S. C., on Feb. 15, for \$450,000, Col. W. G. Elliott being the buyer. Col. Elliott is President of the Wilmington & Weldon Railroad, and represented the Atlantic Coast Line in the purchase. The road has been operated under its present title since 1890. The main line is from Pregnalls, S. C., near Charleston, to Hamlet, N. C., and with branches is 143 miles long. The Atlantic Coast Line crosses the road at Sumter.

**Chattanooga Southern.**—The road was sold on Feb. 14, at Gadsden, Ala., to the reorganization committee, composed of the bondholders of the road, for \$400,000. The original upset price of \$500,000 was reduced recently by decree of the United States Court to the figure of the sale. Judge Henry B. Tompkins, of Atlanta, representing the Central Trust Company, trustee, made the only bid. J. W. Burke, Receiver, sold the property as special commissioner.

**Cleveland, Cincinnati, Chicago & St. Louis.**—The company is preparing to remove its Lake Michigan terminus from Benton Harbor, Mich., to Muskegon, because of lack of terminal facilities at Benton Harbor. The change will also afford a shorter lake route from Allegan and other Michigan points to Chicago.

**Louisville & Jeffersonville Bridge Co.**—The company has filed at Louisville, Ky., a mortgage for \$5,000,000, the United States Trust Co. of New York, and the Union Trust Co. of Indianapolis, being the trustees. It is to secure a similar amount of four per cent. bonds. The bonds issued will retire \$1,000,000 in bonds secured by mortgage to the Masonic Savings Bank, of Louisville, dated Jan. 1, 1890, and payable Jan. 1, 1910, and \$5,000,000 to the Union Trust Co. of Indianapolis, dated Sept. 1, 1893, due Sept. 1, 1943, of which amount \$600,000 is now outstanding. The instrument is signed in behalf of the bridge company by George J. Long, President, and J. W. Baird, Secretary.

**Manhattan.**—The company reports the following earnings for the quarter ending Dec. 31:

	1894.	1893.	Inc. or Dec.
Gross earnings.....	\$2,517,294	\$2,727,735	D. \$210,441
Oper. exp.....	1,364,701	1,392,511	D. 35,810
Net earnings.....	\$1,152,593	\$1,335,194	D. \$172,601
Other income.....	61,138	35,000	I. 26,138
Total income.....	\$1,213,731	\$1,370,194	D. \$156,463
Fixed charges.....	713,451	655,227	I. 58,224
Surplus.....	\$500,280	\$714,967	D. \$214,687

**Macon, Dublin & Savannah.**—Judge Speer, of the United States Court, at Savannah, Ga., has granted an order authorizing the company, in the event of failure to agree with receivers of the Central of Georgia on a price for the 35 mile graded right of way along its proposed route, now owned by the Savannah & Western, to apply to the State courts for proceedings to condemn the property.

The balance sheet shows cash on hand \$108,781, and a profit and loss surplus of \$5,407,895.

**Marquette & Peshtigo.**—Isaac Stephenson, of the Peshtigo Lumber Company, has sold the above railroad, seven miles, including rolling stock, dock privileges, etc., to the Wisconsin & Michigan Company, for \$50,000. The purchasers intend to establish ore docks at Peshtigo, Wis., and extend the line to Faithon Junction, on the Menominee iron range, twelve miles, next year.

**New York & New England.**—In the Connecticut Legislature the resolution incorporating the purchasers of the New York & New England Railroad Company, under the coming foreclosure sale, was favorably reported last week by the incorporation committee. The committee has reported the bill without any of the amendments suggested by counsel for first and second mortgage bondholders.

**Mexican Central.**—The figures of the annual report for the last fiscal year have just been published and make the following comparisons:

	1894.	1893.	Inc. or Dec.
Gross earnings.....	\$8,426,025	\$7,981,768	I. \$444,256
Operating expenses.....	5,459,673	5,136,180	I. 323,493
Net earnings (silver).....	\$2,966,350	\$2,845,587	I. \$120,762
Net earnings (gold).....	1,538,692	1,764,823	D. 226,130
Charges and miscel. int.....	2,297,655	2,213,319	I. 84,336
Deficit for year.....	\$758,972	\$478,525	I. \$280,447

Comptroller Harner says by way of explanation and comment: "The difference in rates of exchange on the United States currency, material and expenses, owing to decline in silver, caused an increase in the expenses, in 1894 over 1893, of \$370,150.77. If this amount be deducted from the operating expenses, it shows that the road, with \$444,256.97 more earnings in 1894, was operated for \$46,657.31 less money than in 1893."

**Oregon Railway & Navigation Company.**—The company has filed an answer to the complaint of the Farmers' Loan & Trust Co., under which Edwin McNeil was appointed Receiver for the company by the United States court. The answer alleges that the Receiver has not operated the lines in the interest of the company, that he has in his possession sufficient revenues to pay off the interest on the coupons of the Farmers' Loan & Trust Co., and asks that they be so applied, the receivership ended, and the property restored to the officers of the company.

**Roaring Creek & Charleston.**—Judge Jackson, of the United States Circuit Court, sitting at Parkersburg, W. Va., has appointed Mr. C. L. Dixon Receiver of the railroad. This road has been in the hands of a local receiver appointed by the West Virginia State Court, but he has been empowered only to borrow a few thousand dollars to pay off certain laborers who were destitute. Mr. Dixon has been acting as Commissioner for the United States Court, under Judge Jackson's instruction, in conjunction with the local receiver. The attorneys of both parties have advised that the receiver be permitted to continue the construction of the road. If this is done it is believed that the road will be made a paying property. The mines and lumbering industries already in operation, or ready to be operated as soon as the road is in shape to afford transportation, will give a considerable traffic.

**Union Pacific.**—The House Committee on Pacific Railroads has again reported to the House the bill known as the Reilly Bill for the settlement of the indebtedness of the Pacific railroads. This is the same bill considered by the House and recommittees to the committee about ten days ago. The proposition of the reorganization committee recently made to accept the principal for full payment of the government debt, will accompany the bill as an amendment without recommendation. Mr. Boatner, of Louisiana, a member of the committee, does not agree to the Reilly bill and will submit a minority report and substitute bill. The substitute will direct a foreclosure sale of the roads for an amount sufficient to pay the entire amount of subsidy bonds issued by the government in aid of the roads, the interest on the bonds to be paid hereafter.

**West Virginia & Pittsburgh.**—Engineers will be put on the surveys for the extension of this road from its present terminus at Camden-on-Gauley, W. Va., to the mouth of Cherry river, by way of the Gauley river valley, as soon as the weather opens. This extension has been under consideration for three years and would have been made before now but for the dull times and the halt in the development of timber territory which has followed. It is not yet decided when the work of construction will begin, but the plans will all be completed, so that the work can begin on short notice when it is desired.

**Wheeling & Lake Erie.**—At the annual meeting of the stockholders at Toledo, Feb. 12, the matter of the absorption of the Valley road was postponed for 30 days, pending decision by Judge Ricks as to which mortgage shall be foreclosed.

#### TRAFFIC.

##### Traffic Notes.

The Interstate Commerce Commission has authorized the Chicago & Northwestern and other roads to disregard the long and short haul clause of the law in making freight rates to the destitute regions in Nebraska. The application was granted the same day it was made. The Union Pacific has reduced the rates on coal from Wyoming mines for the benefit of the people of Nebraska who are suffering from loss of crops.

The loss of traffic suffered by the railroads of Florida in consequence of the great damage done to oranges by the cold weather several weeks ago has already been noted. Similar damage, and more widespread was sustained in the Southern States last week, and the farmers in South Carolina who raise early vegetables for Northern markets were heavy losers. The Southern Express Company gives notice at Charleston that it will carry seed vegetables free to any part of South Carolina.

The railroad and steamship agents of Baltimore held a meeting this week at which action was taken looking to the formation of a local association. Mr. J. C. Whitney, of the Merchants' and Miners' Transportation Line, was chosen Chairman.

The contract for paying 7½ mills a mile on certain private cars, which had to be taken into account as an exception when the interchange rate of six mills was recently adopted, seem to have been longer lived than was then stated. It appears that some of them run until the end of 1895, and it is stated that the New York Central, the West Shore and the Erie have now issued a notice that they will pay the higher rate on some half-dozen kinds of private cars.

The Grand Trunk and the Canadian Pacific have made

slight reductions on flour and grain from interior points to the Atlantic Seaboard.

The New York, New Haven & Hartford has put on a fast Sunday night train from New York to New Haven, starting at 9 o'clock. It is said that this train is to accommodate students of Yale University who live in New York, and that the father of one of the young men has guaranteed the railroad company \$185 a trip for the train for the first four weeks.

The Railroad Commissioners of Texas have issued a commodity tariff fixing rates on bricks, fireclay, etc.

Commissioner Stahlman, of the Southern Railway & Steamship Association, has notified all lines to cease prorating with the Seaboard Air Line, the cause of this action being the discovery of "glaring irregularities and manipulations."

The Trunk Lines have agreed to raise emigrant fares to all Western points on May 1, the basis being \$15 New York to Chicago instead of \$13, the present rate.

#### Chicago Traffic Matters.

CHICAGO, Feb. 20, 1895.

Notwithstanding the enactment of the law permitting railroads to issue 5,000-mile interchangeable mileage tickets, the sentiment of nearly all the roads is against the proposed innovation. The principal adverse argument is that such tickets cannot be so made as to be proof against manipulation by the issuing road. No satisfactory accounting can be made of the coupons unless a clearing house is established, and the roads fail to see why they should be called upon to maintain such an institution simply for the convenience of the drummers without receiving any return whatever for the added expense.

The Wabash, however, has introduced an innovation in the use of mileage on its line by making mileage coupons (except editorial and advertising mileage) good for payment for seats in parlor cars, meals in dining and buffet cars and excess baggage, each coupon being accepted for two cents. The only limitation is that the mileage must be used on the division for which the book is issued. Probably some of the other roads will follow suit and the practice may become general.

Some progress has been made towards a settlement of the differences between the Western lines in respect to passenger traffic. The trouble between the Union Pacific and the Burlington and Rock Island has been settled, but there remains to be settled the demand of the Rio Grande Western for a stop-over privilege on round-trip tickets at Salt Lake City.

The Union Pacific and its connections have issued a joint circular stating the resumption of round-trip business. This removes the most serious remaining obstacle in the way of the new Western passenger agreement, and it is now expected that it will soon go into effect.

The officials of the Central Traffic Association profess to disbelieve the continued assertions of the newspaper reporters that the new 20 cent rate on grain to New York is not being maintained.

The soft coal rate war is still on, notwithstanding several conferences and the reported fixing of a date for the restoration of the rate. The Chicago & Eastern Illinois dealers, as well as officials of that road, claim that the reduction was forced upon them by the action of the Illinois Central in bringing in coal from Southern Illinois mines at reduced rates when trade was dull last summer. Representatives of the Hocking Valley coal interests met here last week to determine upon action to meet the reduced rates of the Illinois and Indiana roads, which are beginning to seriously affect their trade. The Wabash and Monon claim that the Illinois Central and Chicago & Eastern Illinois have made time contracts at the cut rates, and that they (the Wabash and Monon) will not consent to an advance until these contracts are rescinded.

The eastbound roads are complaining that the "Soo" line is again cutting the grain rate from St. Paul to New England points, which is causing a material shrinkage in the grain movement via Chicago.

The Chicago, Rock Island & Pacific has applied to the Central Traffic Association and has been given permission to resume through grain billing from all Illinois points on its line, prorating on the 20-cent basis, first deducting an arbitrary. Under the new arrangement the Rock Island stations are made 111 per cent. points. This action is taken, as alleged, to meet the action of the Rock Island & Peoria. This will probably result in the re-establishment of through billing by the other lines.

The competitors of the Union Pacific are considerably exercised over the action of that road in reducing the rate on coal from the Rock Springs mines 75 cents a ton to Kansas and Nebraska points for the alleged reason that the people are too poor to pay the present prices, and are stealing large quantities of coal in transit and at coaling stations. The other roads look upon this as only a pretext on the part of the Union Pacific to lower the rate, not regarding it as at all necessary.

The Canadian Pacific threatens to make trouble unless the Grand Trunk stops paying excessive commissions on immigrant business. It is said this road is paying as high as six dollars a ticket. The trouble grew out of the granting of a differential to the Canadian Pacific on Puget Sound business, via Port Arthur, notwithstanding the protest of the Grand Trunk.

Peoria wholesalers are complaining because the Illinois lines compromised with the Chicago merchants on rates to interior points in Illinois to meet the competition from Indiana and Michigan caused chiefly by the use of two classifications.

The shipments of eastbound freight, not including live stock, from Chicago by all the lines for the week ending Feb. 16 amounted to 49,738 tons, against 61,532 tons during the preceding week, a decrease of 11,794 tons, and against 48,131 tons for the corresponding week last year. The proportion carried by each road were:

Roads.	WEEK TO FEB. 16.		WEEK TO FEB. 9.	
	Tons.	p. c.	Tons.	p. c.
Michigan Central.....	8,213	16.5	9,849	16.0
Wabash.....	1,467	3.0	3,065	6.0
Lake Shore & Mich. South.....	4,218	8.4	4,775	8.9
Pitts., Ft. Wayne & Chic. gr.....	8,186	6.4	14,650	23.8
Pitts., Cin., Chi. & St. Louis.....	10,609	20.0	8,376	13.6
Baltimore & Ohio.....	4,587	9.3	7,531	12.2
Chicago & Grand Trunk.....	2,281	4.7	2,635	4.4
New York, Chic. & St. Louis.....	4,310	8.6	4,995	8.1
Chicago & Erie.....	4,693	9.5	5,340	7.1
C., C., C. & St. Louis.....	1,775	3.6	1,166	1.9
Totals.....	49,738	100.0	61,532	100.0

Of the above shipments 5,194 tons were flour, 18,006 tons grain and mill stuff, 10,367 tons cured meats, 8,110 tons dressed beef, 1,345 tons butter, 1,200 tons hides and 4,201 tons lumber.